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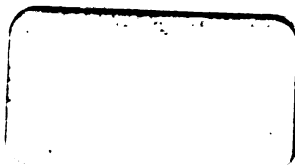
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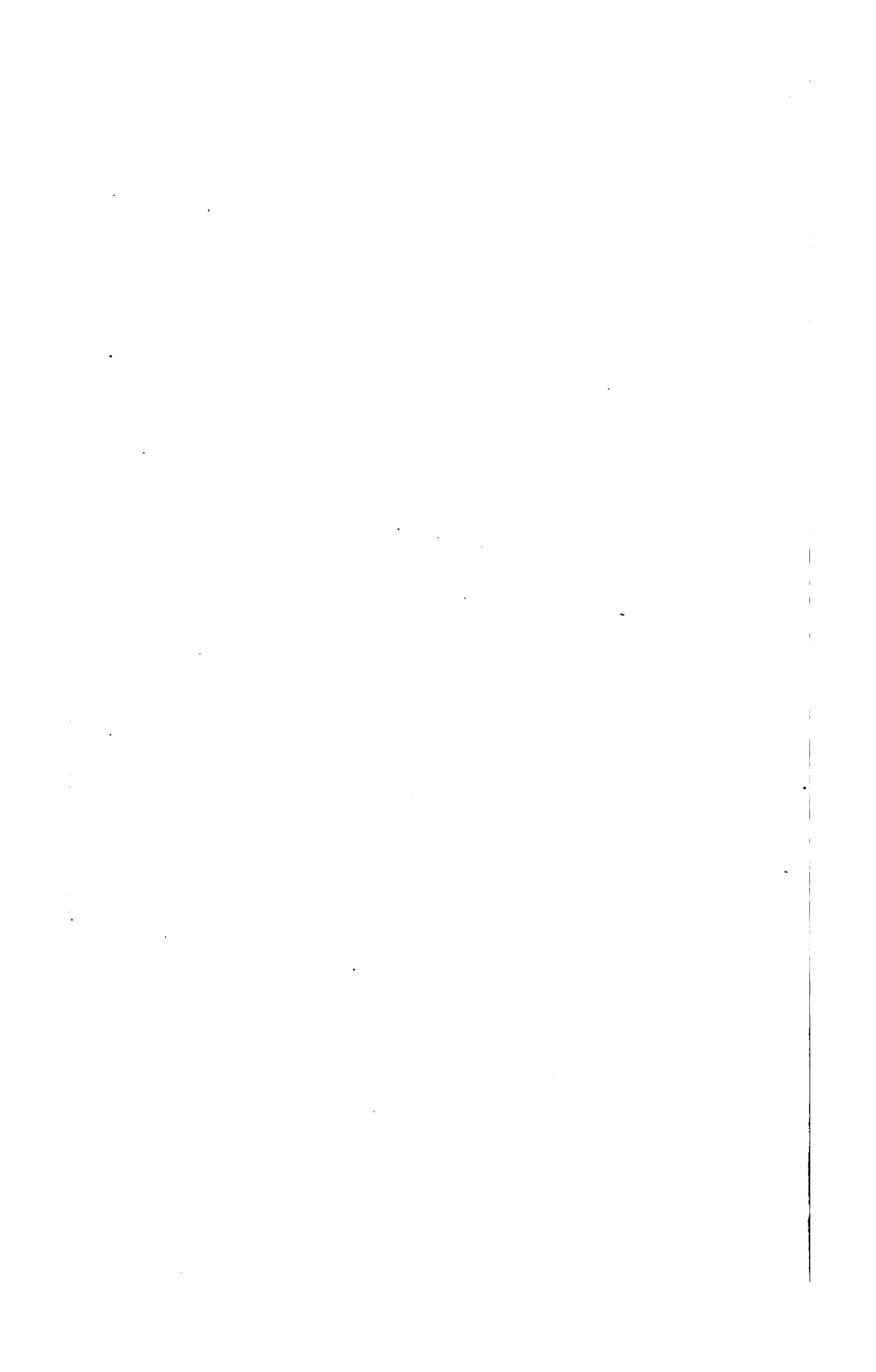
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ANALYTICAL AND TOPICAL INDEX

TO

THE REPORTS OF THE CHIEF OF ENGINEERS AND
OFFICERS OF THE CORPS OF ENGINEERS,
UNITED STATES ARMY,

1866-1900.

VOLUMES I AND II.—RIVER AND HARBOR WORKS.

VOLUME III.—FORTIFICATIONS, BRIDGES, LAWS, MISCELLANEOUS,
AND TOPICAL INDEX.

COMPILED UNDER THE DIRECTION OF

LIEUT. COLONEL C. W. RAYMOND,

Corps of Engineers, U. S. Army,

BY

JOHN McCLURE.

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REFERENCES AND ABBREVIATIONS.

The figures following the black-faced figures indicate the page of the report for the year indicated by the black figures. In some instances, especially prior to 1877, the volume is indicated by lower-case i's.

References made at times to various documents will be easily understood.

The most common of the abbreviations are—

b. m. = board measure.	m. = mean.
c. = cubic.	p. m. = place measure.
c. s. = Coast Survey.	s. = short; square.
f. = foot; feet.	s. m. = scow measure.
h. = high.	t. = tide; ton.
l. = low; linear.	w. = water.
lb. = pound.	y. = yard.
x. = 1000.	

The abbreviations employed for titles of officers are easy to understand.

*Table showing what page ends each part of the annual reports of the Chief of Engineers,
U. S. Army, from 1866 to 1900.*

Year.	Part 1.	Part 2.	Part 3.	Part 4.	Part 5.	Part 6.	Part 7.	Part 8.
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1893.....	1140	1793	2649	3544	3919	4404
1894.....	826	1332	2008	2696	3074	3591
1895.....	1020	1724	2525	3070	3615	3956	4301
1896.....	690	1338	2060	2672	3401	4196
1897.....	1190	1876	2648	3503	3835	4225
1898.....	1074	1686	2414	3135	3458	3855
1899.....	1206	2045	2724	3290	3653	4002
1900.....	1072	1792	2806	2906	3946	4524	5006	5535

a Bound with the three other parts into one volume.

b Each part begins with page No. 1.

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FORTIFICATION WORKS.

NOTE.

This division of the index comprises two parts: I, Outline of the annual reports of the Chief of Engineers and of the Boards of Engineers; II, Fortification works.

PART I.—OUTLINE OF THE ANNUAL REPORTS OF THE CHIEF OF ENGINEERS AND OF THE BOARDS OF ENGINEERS.

CHIEF OF ENGINEERS.

REPORTS:

66, ii, 2; 67, 2; 68, 4; 69, 4; 70, 4; 71, 4; 72, 2; 73, 4; 74, 4; 75, 4; 76, 4; 77, 4; 78, 4; 79, 4; 80, 4; 81, 4, 399; 82, 4, 435; 83, 4; 84, 4; 85, 4; 86, 4, 499; 87, 4; 88, 4; 89, 4; 90, 4; 91, 4; 92, 4; 93, 4; 94, 4; 95, 4; 96, 7; 97, 7; 98, 8; 99, 9; 1900, 5.

SUMMARY OF REPORTS:

1870. Results of a series of experiments with modern projectiles upon iron shields and earth and sand parapets, 70, 4. Col. J. G. Barnard, Lt. Col. H. G. Wright, and Capt. P. S. Michie ordered to determine by actual inspection the extent to which iron has been introduced into seacoast defenses by the maritime powers of Europe, 70, 10.

1876. Comparison of defensive armament with that of an enemy's offensive armament. Cost of some of the British ships of war, 76, 5; 79, 6.

1880. Seacoasts, proper method of defense. Comparison of the methods adopted by other countries for seacoast defenses, 80, 4; 81, 4.

1881. Report by Lt. Col. Q. A. Gillmore on the condition of our seacoast defenses and the importance of strengthening them, involving the following subjects: An unprotected seacoast; character of the attack; requirements of a good defense; functions of the Regular Army and militia; defense by a harbor fleet alone; defense by fortifications and their accessories; a perfect defense; torpedo boats

and their achievements; with a brief description of Buffington's and King's counterpoise gun carriages, with drawings, 81, 399.

1882. Report by Lt. W. H. Bixby of a journey made, 1881-82, in Belgium, Holland, Germany, and England, to obtain information in relation to turrets, armor plate, and the service of heavy guns of seacoast defenses, 82, 435.

1883. Seacoast and lake frontier defenses considered. Estimated cost of fortifications of eight principal ports, \$60,000,000. Itemized estimate of appropriations required for 1885-86, 83, 4.

1885. Preparation of report by Capt. Bixby upon his investigations in Europe, 84, 421.

1885. Operations restricted to those necessary for the preservation and repair of existing works. The subject of the defensive system of the country, as far as regards the ports at which fortifications or other defenses were most urgently required, referred by Congress to a Board of which the Secretary of War was president. Estimated cost for the modification and repair of existing works for 1886-87, \$1,274,000, 85, 4. Capt. Bixby's report upon investigations in Europe completed, 85, 421.

1886. Comparisons of fortifications of the present day, both for offense and defense, with those of 1860. The largest gun in service, 1860, was the 10-inch Rodman smooth bore, the energy of whose projectile was 2,000 f.-t., while the

CHIEF OF ENGINEERS—Continued.

guns of the present day deliver 45,000 f.-t. of energy, and are steadily increasing in power. Discussions of a naval attack and coast defenses, localities given in order of urgency for defensive armament. The defenses and their accessories discussed, comparison of the U. S. 12-inch B. L. rifle, cast iron, and the Krupp's 12-inch B. L. rifle, steel; other calibers discussed; torpedo system considered among the most important means of conducting an active defense of the coast. List of ports, with description of fortifications and other defenses with reference to armament, mines, torpedoes, etc. Practical measures for obtaining the appliances for defenses. Recapitulation of estimates. **86**, 499-525.

1887. Estimates for construction of gun and mortar batteries, torpedo casemates and galleries, and for purchase of torpedo material for the defense of the chief seaports, **87**, 4.

1888. Acts of 1876-80 appropriated each year for the protection, preservation, and repair of fortifications and other works of defense, \$100,000; acts of 1881-84, annually, \$175,000, and act of 1885, \$100,000. This latter was the last appropriation and was practically exhausted by the end of the year for which it was appropriated. Estimates of appropriation required for 1889-90, \$4,952,000. **88**, 4.

1889. Extract from report of Board of Engineers with reference to the existing contracts for making armament. Main features of the project of the Board on fortifications, 1885, and permanent Board of Engineers, with estimates; \$200,000 appropriated for torpedoes for harbor defense and \$250,000 for casemates and cable galleries for operating submarine mines. Repair and preservation of Fort Marion, St. Augustine, Fla., advised; \$117,000 appropriated for sea walls and embankments. Estimates given of appropriations required. **89**, 4.

1890. Estimates for defensive works; \$117,000 appropriated for sea walls and earth embankments at Fort Niagara, Davids Island, and Governors Island, N. Y., **90**, 4.

1891. Localities named at which appropriations are to be expended and where defensive works are in progress, **91**, 4.

1892. Estimates and projects given, **92**, 4.

1893. Proposed new works. Table giving locality and armament for which funds have been allotted. **93**, 4.

1894. Allotments made, **94**, 4, 11.

1895. Projects for defense prepared for localities named. Places named where allotments have been made for emplacements and additional platforms; 25 casemates completed at places named, and 3 more being built; \$20,000 appropriated for submarine-mine material and necessary appliances. **95**, 4. Places named where allotments have been made for beginning new works, **95**, 12. Places named where work of preservation and repair of fortifications has been carried on during the year, **95**, 13; \$150,000 appropriated, 1894, for sites for defenses at Narragansett Bay, Baltimore Harbor, and Charleston Harbor, **95**, 14.

1896. List of places named where detailed projects for artillery defenses have been prepared. Use made of the existing old-type fortifications, **96**, 7. \$500,000 appropriated for sites; negotiations in progress. Work in progress on sea walls and embankments. Emplacements named where allotments have been made. Statement showing the conditions of the various emplacements Sept. 15, 1896. Total armament proposed in the projects for defenses. **96**, 10. \$100,000 appropriated for submarine-mine defense; 28 casemates completed, 1 more being built, **96**, 11.

1897. Localities named where title to sites has been obtained. Table giving emplacements provided for. Work in progress at 22 ports. Objections given to the contract system as applied to fortifications. Statement showing the condition of the various emplacements at the close of the fiscal year. **97**, 10. \$150,000 appropriated for submarine-mine material; 4 casemates, 2 special torpedo storehouses and storerooms being built, **97**, 11.

1898. Localities named where projects for permanent and temporary coast defenses have been prepared. Statements of appropriations for gun and mortar batteries and of the type of gun, with total guns and total emplacements provided. Tables giving total number of emplacements provided for, and either completed or under construction at the beginning of the year. Nearly all the guns mounted transferred to the artillery. **98**, 8. Discussions of the duties of a fortress commander as applied to the defenses of New York Harbor, by Brig. Gen. G. L. Gillespie, **98**, 579.

Dynamite batteries: These batteries constructed under the Ordnance Department in past years at locations named; \$150,000 appropriated in 1898 for work in San Francisco Harbor; work in progress. Localities given where batteries will be erected. **98**, 11.

Submarine mines: List of some of the torpedo material purchased.

Preservation and repair of fortifications: Necessary minor repairs made.

Sea walls and embankments: \$55,000 appropriated for repairs at places named.

CHIEF OF ENGINEERS—Continued.

Sites: Localities given where title has been obtained to sites.

National defense: Allotments and their objects for 1898 given. 98, 14.

1899. Thirty localities named where projects for defense have been adopted, also places where considerable study has been given coast defenses of insular possessions. Work has been carried on at 25 localities, at nearly all of which sufficient heavy guns and mortars now installed permit of an effective defense against naval attack. Temporary batteries maintained till the close of the war with Spain. 99, 9.

Gun and mortar batteries: The contract work authorized by Congress completed except one contract. Discussion of contract work.

Dynamite batteries: Work completed at San Francisco; provision yet remains for work at Sandy Hook, and other places given where contracts have been made under act of Sept. 22, 1888.

Range and position finders: The question of the type of finder best adapted not yet definitely settled. 99, 12.

Preservation and repair of fortifications: Repairs confined mainly to engineer material in the new seacoast batteries. The question of waterproofing magazines to be further considered.

Supplies for seacoast defenses necessary for operating electric light and power plants, no funds available. 99, 14.

Sea walls and embankments: \$2,500 appropriated. Work carried on at Fort Schuyler. 99, 14.

Sites: \$300,000 appropriated, negotiations in progress at places given, 99, 14.

Submarine mines: \$1,386,000 appropriated for torpedo material and the planting and maintaining of the mine fields; \$50,000 appropriated for torpedoes for harbor defense, and applied to purchase of additional torpedo material and construction of additional storage facilities for material on hand, and torpedo experiments. The practical experience gained with the adopted torpedo system

during the war with Spain invaluable. 99, 15.

National defense: Appropriations and purposes given, 99, 15.

1900. Localities named where projects for defense have been adopted, 1900, 6. \$1,800,000, the estimated cost for defense of San Juan, Porto Rico. Rapid increase in the resisting power of armor plate in ship construction, necessitating corresponding changes in the details of coast defenses. The seacoast defenses are now about 50 per cent completed. 1900, 7.

Gun and mortar batteries: Appropriations, 1890 to 1900, \$22,142,212.62, not including \$306,805.04 for national defense. Tables giving type of gun and carriage, with total number of each provided, also emplacements provided. Table giving total number of emplacements of every kind provided for by all appropriations, also their condition. 1900, 7.

Dynamite batteries: \$180,000 appropriated for pneumatic dynamite batteries; work begun at Sandy Hook, and plans in progress for other places given, 1900, 10.

Range and position finders: \$150,000 appropriated for 25 additional range-finder stations; 30 previously constructed; total number projected, 177, 1900, 10.

Preservation and repair of fortifications: Waterproofing, and care of engineer material the principal work, 1900, 11.

Supplies for seacoast defenses: \$25,000 appropriated for supplies for light and power plants, 1900, 11.

Sea walls and embankments: \$200,000 appropriated for places named; work in progress, 1900, 11.

Sites: \$200,000 appropriated; sites bought and proceedings instituted for others, 1900, 12.

Submarine mines: \$50,000 appropriated; work in progress equipping all harbors with a full complement of torpedo material, 1900, 12.

^aUp to June 30, 1900, provision had been made for emplacing 309 heavy guns, 368 rapid-fire guns, and 372 12-inch mortars.

The status of emplacements for which funds had been provided by Congress up to June 30, 1900, was as follows:

	12-inch.	10-inch.	8-inch.	Rapid fire.	12-inch mortars.
Guns mounted	57	105	175	53	240
Ready for armament	23	8	16	189	84
Under construction	13	9	3	81	46
Not yet begun				45	
Total	93	122	94	368	372

¹ Ten of these, mounted temporarily, have since been dismounted.

² Including seventy 6-pounders not requiring permanent emplacements.

BOARD OF ENGINEERS ON FORTIFICATIONS.**Engineers.**

CHIEF OF ENGINEERS. Reports, **66**, ii, 2; **67**, 2; **70**, 28; **71**, 26; **72**, 24; **73**, 25; **74**, 29; **75**, 28; **76**, 30; **77**, 24; **78**, 28; **79**, 33; **80**, 54; **81**, 56; **82**, 56, 411; **83**, 51; **84**, 55; **85**, 48; **86**, 48; **87**, 5; **88**, 5; **89**, 8; **90**, 6; **91**, 11; **92**, 16; **93**, 15; **94**, 15; **95**, 15; **96**, 5, 447; **97**, 4, 553; **98**, 5, 557; **99**, 5, 645; **1900**, 5, 727.

OFFICERS.^a

Col. G. J. Barnard, 1867-80.
Col. G. W. Cullum, 1867-74.
Col. Z. B. Tower, 1867-83.
Lt. Col. H. G. Wright, 1867-79.
Maj. C. B. Reese, 1867.
Capt. C. W. Raymond, 1870.
Col. J. Newton, 1880-84.
Col. H. L. Abbot, 1880-95.

Col. C. B. Comstock, 1883-94.
Col. J. C. Duane, 1884-87.
Col. D. C. Houston, 1886-93.
Lt. Col. W. McFarland, 1886-88.
Col. T. L. Casey, 1887-89.
Col. W. P. Craighill, 1887-89.
Maj. W. R. King, 1887-89.
Col. G. L. Gillespie, 1889-1900.
Col. H. M. Robert, 1893-1900. Reports, **96**, 447; **97**, 553; **98**, 557; **99**, 645; **1900**, 727.

Maj. C. W. Raymond, 1895-96.
Maj. J. G. D. Knight, 1896-97.
Capt. H. F. Hodges, 1896-98.
Maj. H. M. Adams, 1897-99.
Col. J. W. Barlow, 1899-1900.
Capt. W. V. Judson, 1899.
Capt. E. Jadwin, 1900.

BOARD OF ENGINEERS ON THE PACIFIC COAST.**Engineers.**

CHIEF OF ENGINEERS. Reports, **67**, 2; **68**, 4; **70**, 28; **71**, 26; **72**, 25; **73**, 26; **74**, 32; **75**, 32; **76**, 32; **77**, 28; **78**, 31; **79**, 39; **80**, 60; **81**, 60; **82**, 60; **83**, 56; **84**, 64; **85**, 52.

OFFICERS:^b

Lt. Col. B. S. Alexander, 1867-79.
Capt. C. W. Raymond, 1867-69.
Capt. T. H. Handbury, 1870-73.
Lt. Col. G. H. Mendell, 1872-85.
Lt. Col. C. S. Stewart, 1873-85.
Lt. Col. J. H. Weeden, 1873-77.
Lt. Col. R. S. Williamson, 1876-82.
Capt. A. H. Payson, 1877-83.
Maj. J. M. Wilson, 1878.
Maj. G. L. Gillespie, 1879-80.

SUMMARY OF REPORTS:

1872. Board of Engineers organized in June, 1865. The projects for the application of torpedoes to harbor defense was considered, the commanding officer of the engineer battalion being a member for that purpose. **72**, 25.

1877. Recommendations of the board, **77**, 27; **78**, 31.

1878. Project for the year 1879-80 presented, **78**, 34.

1880. Plans for coast defenses, questions on river and harbor improvements, torpedo defense, with results of the investigations and recommendations of the Board, **80**, 54; **81**, 56.

1882. Coast defenses, torpedo defenses, and other subjects considered, **82**, 56. Report, dated Nov. 30, 1881, on the condition of the fortifications, and what number of them, if any, could be dispensed with, **82**, 411.

^a And for the time being the officers of the defenses under consideration, **73**, 25.
Col. G. H. Mendell was a member when matter pertaining to the defensive works on the Pacific coast was acted upon, **80**, 6.

^b And for the time being the officers of the defenses under consideration.
List of subjects referred by the Chief of Engineers, and the special duties of the individual members, given in each annual report beginning with 1879.

1883. Coast defense, torpedo defense, etc., considered, **83**, 15.

1884. Coast defenses, consideration of. Elements of defense for the entrance to a harbor given, and estimated cost of heavy guns and emplacements needed for localities mentioned. \$75,000 allotted for torpedo defense, experiments continued with explosives, with results and estimates required. Summary of operations of the Board: Aug. 30, 1884, the Board submitted estimates for heavy guns and emplacements for the places given. **84**, 55.

1885. Fortifications, river and harbors, coast defenses, and torpedo defense considered; experiments made with the Sims movable torpedo and new explosives, **85**, 48.

1886. Coast defense, torpedo defense, with results of experiments, **86**, 48.

BOARD OF ENGINEERS:

(Endicott Board.) Constituted by act of March 3, 1885, to examine and report at what ports, fortifications or other defenses mostly required, the character and kind of defenses best adapted for each, with reference to armament and the utilization of torpedoes, mines, or other defensive appliances. Report, **86**, 499. (W. C. Endicott, Secretary of War, president; Brig. Gen. S. V. Benet, Chief of Ordnance; Brig. Gen. J. Newton, Chief of Engineers; Lt. Col. H. L. Abbot, Corps of Engineers; Capt. C. S. Smith, Ordnance Department; Commanders W. T. Sampson and C. F. Goodrich, U. S. Navy, and J. E. Morgan, jr., of Pennsylvania, and E. Corning, of New York.

BOARD ON TORPEDO SYSTEM.

Engineers.

CHIEF OF ENGINEERS. Reports, 99, 5; 1900, 5.

OFFICERS:

Capt. J. Millis, 1898-99.

Lt. J. F. McIndoe, 1899.

Lt. G. P. Howell, 1899-1900.

Maj. J. G. Knight, 1898-1900. Reports, 99, 649; 1900, 731.

Capt. H. Jervey, 1900.

SUMMARY OF REPORTS:

1873. \$300,000 appropriated for torpedoes for harbor defense and preservation of the same, and for obtaining the latest information concerning the electrical apparatus, experiments, conditions of service, and the systems of torpedo defense in other countries. Maj. T. L. Casey and H. L. Abbot ordered to Europe to obtain this information. 73, 25.

1874. Some results of torpedo experiments, 74, 30.

1875. Torpedo experiments continued, number of trained men necessary to plant mines, 75, 29.

1876. Experiments with the iron target, torpedo crate, torpedo cases, etc., 76, 30.

1877. Torpedo trials: Submerged ring, torpedo target, torpedo material, and reduction of data, with recommendations, 77, 25.

1878. Torpedo trials, submerged ring, torpedo target, torpedo cases, circuit closers, the telephone, with recommendations, 78, 30. Current observations in reference to torpedo defense, by Lt. A. H. Payson, 78, 1304.

1879. Some results of the analysis of subaqueous explosions and of electrical fuses, with recommendations, 79, 35.

1880. Results of investigations of the sympathetic explosions of dynamite and other experiments, 80, 57.

1899-1900. Inventions considered, 99, 649; 1900, 731.

PART II.—FORTIFICATION WORKS.

NOTE.

The names of centers of coast defense are arranged in alphabetical order. Under each name thus given the following subheads are arranged in the order in which they are placed below, and the data pertaining to each of these subheads are given in historical order, except in the case of engineering features.

Contracts.—Important contracts, etc., the more important articles, prices, quantities, being mentioned.

Engineers.—Subdivided into: References to reports of the Chief of Engineers; Boards and their duties; Engineers in charge, showing term of service; assistants.

Engineering features.—Cost of work, electric installations, arrangement of plant, these and other data under this head being arranged in alphabetical order.

Forts and batteries.—Such works are arranged separately in the order of mention. Under each work brief abstracts of operations by years are given.

Miscellaneous.—References to data not coming properly under the other subheads.

Preservation and repair.—References to work relating to preservation and repair.

Range and position finders.—Important items concerning these instruments.

Sea walls and embankments.—The more important data relating to these structures.

Sites.—Acquisition, lease, sale, etc., of sites.

Submarine mines.—Data relating to torpedo casemates, storehouses, cable tanks, searchlights, etc.

ADAMS. (See *Massachusetts.*)**ALCATRAZ ISLAND (Fort on).** (See *San Francisco, Cal.*)**AMELIA ISLAND, FLA.** (See *Fort Clinch, Georgia, and Cumberland Sound.*)**ANDREW.** (See *Boston Harbor, Mass.*)**ANGEL ISLAND (Batteries at).** (See *San Francisco, Cal.*)**BALTIMORE, MD.****Contracts.**

1897. One 12-inch and 3 8-inch gun emplacements with wharf, \$122,064.46. Mortar battery for 8 12-inch mortars, with wharf, \$91,513.31, **97**, 646, 649.

1898. Electric-lighting plant, mortar battery, \$2,820, **98**, 662. Two 5-inch R. F. gun battery, \$15,798.50, **98**, 663.

1899. Sea walls and embankments at sites 1 and 3, \$24,967. Portland cement, 1,785 barrels, \$2.18 per barrel. Rosendale cement, 7,150 barrels, 95 cents per barrel. Brick, \$13 to \$45 per thousand, **99**, 810. Torpedo storehouse, \$3,293, **99**, 817. Wharf, \$5,481.50, **99**, 818.

1900. Electric-lighting plant, \$1,650, **1900**, 866.

Engineering features.

Cement, slag, for concrete, **98**, 665.
Concrete, cost per c. y., **98**, 659, 661;
99, 819, 820, 821; **1900**, 871, 874.
Excavation, cost per c. y., **98**, 659, 661.
Grading, cost per c. y., **98**, 659.
Granolithic concrete, **98**, 660; **1900**, 871, 874.

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Sand containing water under pressure, method of laying concrete on, **97**, 647.
Waterproofing magazines, **98**, 661, 664;
99, 818, 819; **1900**, 866.

Engineers.

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94, 14; **95**, 15; **96**, 15, 488; **97**, 15, 639;
98, 21, 658; **99**, 23, 805; **1900**, 21, 866.

^a List of works as arranged under this head—

Fort McHenry.

Fort Carroll.

Lazaretto Point, opposite Fort McHenry.

Site 1.—Emplacement for one 12-inch gun and three 8-inch guns.

Site 3.—Emplacements for eight 12-inch mortars.

Site 3.—Two emplacements for 5-inch R. F. guns.

Rock Point.

Site 1.—Two emplacements for 4.7-inch R. F. guns.

Site 3.—Two emplacements for 12-inch B. L. rifles on disappearing carriages.

Site 2.—Two emplacements for 12-inch B. L. rifles on barbette carriages.

Site 1.—Two emplacements for 15-pounder R. F. guns.

Site 2.—Two emplacements for 5-inch R. F. guns on balanced pillar mounts.

Site 2.—Two emplacements for 15-pounder R. F. guns.

Site 3.—Two emplacements for 6-inch B. L. rifles on disappearing carriages.

Site 3.—Two emplacements for 15-pounder R. F. guns.

Site 4.—Two emplacements for 6-inch B. L. rifles on disappearing carriages.

Site 2.—Remodeling old work.

Site 3.—Two emplacements for 15-pounder R. F. guns.

BOARD OF ENGINEERS:

Constituted to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with. Report, **82**, 421.

Report, **87**, 11.

ENGINEERS IN CHARGE:

Capt. C. N. Turnbull, 1866.

Col. W. P. Craighill, 1866–93.

Maj. J. G. Parke, 1868.

Col. J. H. Simpson, 1868–70.

Lt. Col. J. D. Kurtz, 1870.

Capt. C. P. Phillips, 1878.

Capt. T. Turtle, 1883.

Col. P. C. Hains, 1896–99.

Lt. C. W. Kutz, 1898–1900.

Lt. Col. O. H. Ernst, 1900.

ASSISTANT. Lt. C. W. Kutz, 1897–1900.

Forts and batteries. a—Operations.*Fort McHenry.*

1775. Fortifications begun, **80**, 37.

1794. Present work built, **80**, 37.

1866. Reinforcing pintle centers in exterior battery; substitution of low for high traverse circles; construction of magazines and traverses. The exterior battery platforms ready for 15-inch guns. **66**, 12.

1867. Water battery ready for armament; magazines, bombproofs and traverses nearly completed. Minor work. **67**, 11.

1868. New work of parapets of water battery and magazine coverings consolidated; glacis of water battery re-formed; new drains cut for magazines; and minor work. **68**, 15.

BALTIMORE, MD.—Continued.

1869. Repairs to terreplein of water battery, and ditch of main work; brick hoods of magazines increased; defective drains in main work relaid, and minor work on slopes. 69, 14.

1870. Minor repairs to slopes, 70, 21.

1871. Wharf rebuilt and minor work; observations made to determine the direction and force of the surface and subsurface currents for use in placing explosives, 71, 17.

1872. \$21,000 appropriated. Preservation and repair. 72, 14.

1873. \$25,000 appropriated. Work begun on new large exterior battery; minor repairs to slopes of water battery. 73, 15.

1874. Work on parapet, and heavy embankment for the terreplein on front 4 of new earthen battery; concrete work of 3 magazines; and completing drainage, 74, 17.

1875. \$20,000 appropriated. Minor repairs to revetment of parapet of new battery and exterior battery of main work. 75, 18.

1876. Sand parapet extended; sand covering placed on 3 magazines; terreplein partly graded, and minor repairs to slopes, 76, 19.

1877-78. Preservation and repair, 77, 15; 78, 18.

1879. Breaches in sea wall repaired. Preservation and repair. 79, 22.

1880. Preservation and repair, 80, 38.

1881. Repairs to sea walls, slopes, and drains, 81, 37; 82, 34.

1883. Repairs to slopes, etc., 83, 31.

1884. Repairs to scarps, slopes, and drains, 84, 35.

1885-86. Repairs to slopes, drains, gutters, pavements, and retaining wall of ramp; and building wire fences, 85, 29; 86, 28.

1895-96. Work on sea wall completed, 95, 15; 96, 489.

1897. Grounds back of sea wall graded and seeded, 97, 640.

1898. Minor repairs, 98, 658.

1899. \$1,000 allotted for preservation and repair, 99, 806, 818.

1900. Preservation and repair, 1900, 866.

Fort Carroll.

1847. Work begun, 80, 38.

1866-67. Preservation, 66, 13; 67, 12.

1868. Work is completed on Fronts 1, 2, 3, 4, and 5 up to the springing line of casemate arches of second tier, 68, 15.

1869. Temporary wharf repaired, 69, 14.

1870. Preservation and repair, 70, 21.

1871. Observations made to deter-

mine the direction and force of the surface and subsurface currents, for use in placing explosives, 71, 17.

1872-73. Preservation, 72, 14; 73, 15.

1874. One wooden center pintle platform for 15-inch gun laid and temporary parapet erected in front of it. One 15-inch gun mounted on center pintle carriage; minor repairs. 74, 18.

1875-78. Preservation and repair, 75, 18; 76, 19; 77, 15; 78, 18.

1879. Project for completion, by Board of Engineers. Preservation and repair. 79, 23.

1880-82. Preservation and repair, 80, 38; 81, 38; 82, 35.

1883. About 8,000 s. f. of graveled felt roofing placed on casemate; and minor repairs, 83, 31.

1884-86. Care and preservation, 84, 36; 85, 29; 86, 29.

Lazaretto Point, opposite Fort McHenry.

1870. Site selected, 70, 21.

1871. Observations made to determine the direction and force of the surface and subsurface currents for use in placing explosives, 71, 17.

1872. \$13,000 appropriated. To be transferred to Fort McHenry. 72, 14.

Site 1.—Emplacement for one 12-inch gun and three 8-inch guns.

1897. Land acquired, and \$143,800 allotted for fortifying same; work begun by contract; 13,681 c. y. excavated and placed in parapet and 1,682 c. y. concrete laid; work on sea wall, 97, 641.

1898. \$3,200 allotted for mounting guns and carriages; moving from wharf done by contract; battery completed, including ammunition service and electric plant; summary of work; total cost \$143,800, 98, 659.

1899. Battery turned over to artillery; repairs to slopes and power plant; exhaust fans installed to prevent dampness, 99, 806, 818.

1900. 7 electrical exhaust fans installed; roadway built and minor repairs, 1900, 866.

Site 3.—Emplacements for eight 12-inch mortars.

1897. \$134,637.25 allotted. Site acquired, work begun by contract; wharf completed, and 6,591 c. y. excavated and placed in slope and 1,403 c. y. of concrete placed, 97, 647.

1898. Description of battery. All concrete mixed by hand, guns and carriages mounted, and battery completed under contract. Summary and cost of work. Total cost \$113,000. 98, 660.

BALTIMORE, MD.—Continued.

1899. Electric plant installed and battery wired by contract; battery turned over to the artillery. Preservation and repair. **99**, 813, 820.

1900. Repairs to electric light and power plant, **1900**, 869.

Site 3.—Two emplacements for 5-inch R. F. guns.

1897. Work to be done by contract, **97**, 647.

1898. \$17,400 allotted. Contract price \$15,798.50. Work begun Aug. 10, 1897, completed June 1, 1898. Description of battery. No carriages on hand. **98**, 663.

1900. Carriages received and mounted, roadway built; no guns on hand. Total cost \$17,400. **1900**, 870.

Rock Point, Md.

1897. Site acquired by condemnation proceedings; \$1,400 allotted for wharf 1,080 f. long, completed, **97**, 649.

1898. Marking boundaries with concrete monuments, and inclosing the property with wire fence, **98**, 666.

Site 1.—Two emplacements for 4.7-inch R. F. guns.

1898. \$15,000 allotted. Work begun in April, 1898, under oral agreement by same firm that built 8-inch and 12-inch battery, and practically completed May 10, 1898. Summary, and cost of work. **98**, 660.

1899. Two ammunition hoists installed and guns mounted. Battery turned over to the artillery. **99**, 806, 819.

1900. Repairs to electric plant and slopes, **1900**, 867.

Site 3.—Two emplacements for 12-inch B. L. rifles on disappearing carriages.

1898. \$100,000 allotted. Work begun by hired labor. One platform completed. Description of plant, water supply, and construction. **98**, 664.

1899. \$18,500 allotted. Guns mounted, elevators installed, battery wired, and completed in all details and turned over to the artillery; cost of battery, \$113,500. Handling and mounting 2 guns and carriages, \$4,561.12. **99**, 814, 820.

1900. Repairs to electric plant. Defects in carriages corrected at the expense of the Ordnance Department. **1900**, 870.

Site 2.—Two emplacements for 12-inch B. L. rifles on barbette carriages.

1898. \$80,000 allotted. Work begun by hired labor, description of bat-

tery and plant. Both platforms built and 2,500 c. y. of concrete placed. Character of site necessitated a number of modifications in type plans. **98**, 666.

1899. Battery completed, power house built, carriages mounted, but no guns on hand, **99**, 812, 819.

1900. Guns mounted and fired to test stability of platforms. Battery turned over to the artillery. Repairs to earth parapet and electric plant. Cost of battery, including mounting guns and carriages, \$82,647.29. **1900**, 868.

Site 1.—Two emplacements for 15-pounder R. F. guns.

1899. \$6,610 allotted. Work begun in April and practically completed; no guns on hand. Waterproofing. Work on sea walls, grading grounds, and range finder erected. **99**, 807, 819.

1900. Minor details of battery finished; no guns or mounts on hand. Total cost, \$6,860. **1900**, 867.

Site 2.—Two emplacements for 5-inch R. F. guns on balanced pillar mounts.

1899. \$12,300 allotted. Work begun and completed, except mounting guns and carriages. Summary and cost of work. **99**, 812, 819.

1900. Grounds graded and seeded. No complete carriage or guns on hand. **1900**, 868.

Site 2.—Two emplacements for 15-pounder R. F. guns.

1899. \$7,600 allotted. Work begun in March and completed, except minor details; no guns or mounts received. **99**, 813, 820.

1900. Stairway and rails erected. Grounds graded and seeded, flag walks placed in rear of battery. No guns or mounts on hand. Cost of battery without armament, \$8,706.52. **1900**, 868.

Site 3.—Two emplacements for 6-inch B. L. rifles on disappearing carriages.

1899. \$47,000 allotted. Excavation begun, **99**, 815.

1900. Carriages mounted; grounds graded and seeded. No guns on hand. Battery turned over to the artillery. Cost to date, \$37,933.91. Summary and cost of work. **1900**, 871.

Site 3.—Two emplacements for 15-pounder R. F. guns.

1899. \$11,345 allotted. Work completed, except earth parapet and stairway. Summary and cost of work. **99**, 815, 820.

1900. Parapet filled in and sodded;

BALTIMORE, MD.—Continued.

stairway and rail erected; grounds graded and seeded. No guns or mounts on hand. Battery turned over to the artillery. Total cost, \$10,445. 1900, 870.

Site 4.—Two emplacements for 6-inch B. L. rifles on disappearing carriages.

1899. \$50,000 allotted. Wharf built by contract. Plant installed, 99, 817, 821.

1900. Battery completed, except wiring and furnishing trolleys and blocks; carriages mounted and the battery turned over to the artillery. Total cost to date, \$48,255.54. Summary and cost of work. 1900, 874.

Site 2.—Remodeling old work.

1900. \$12,800 allotted for removing part of old masonry above the crest line of modern batteries to make it conform, both in appearance and utility, to the modern emplacements; work in progress, 1900, 869.

Site 3.—Two emplacements for 15-pounder R. F. guns.

1900. \$10,000 allotted, 1900, 872.

Preservation and repair.

1899. \$1,000 allotted, 99, 806. General repairs to batteries at site No. 1, 1900, 868.

1900. \$1,000 allotted. General repairs, site No. 2, 1900, 869. \$1,500 allotted for repairs to site No. 3, 1900, 873. \$320 allotted for site No. 4, 1900, 875.

Range and position finders.

1899. \$50 allotted, erecting range finders at sites 1 and 3, 99, 807.

Sea walls and embankments.

Fort McHenry.

Estimated cost of repairs to sea wall \$10,000, 94, 14. Wall in rear of cemetery, 227 f. long, completed; rear of site of fort, about 808 f. long, in progress, 95, 15. \$8,591.51 allotted; sea wall 808 f. long completed, 96, 489. \$13,750 al-

lotted; sea wall built by contract, cost \$14,214.90, 97, 640.

Hawkins Point.

\$7,000 allotted for repairs to sea wall, work in progress, 97, 641. 3,049 c. y. of riprap and 4,476 c. y. of oyster shells and earth filling placed, cost \$6,645.40, 98, 659. \$35,000 allotted for sea walls at sites 1 and 3 under contract, some work, 99, 807, 821. 1600 c. y. of riprap placed on Face 6, 99, 820. Sea wall at site No. 1, completed by hired labor (contract expired), 1900, 867. Sea wall at site No. 3 completed by hired labor, 1900, 872. \$8,000 allotted for sea wall at site No. 4, 1900, 875.

Sites.

Three sites needed for batteries, 95, 14. \$46,500 allotted for sites at North Point, 28½ acres; Hawkins Point, 12.47 acres; and Rock Point 100 acres, 96, 489.

\$4,500 paid for land at Hawkins Point, 97, 641. Site at North Point purchased, \$13,500 paid, 97, 647. \$27,500 paid for 100 acres of land at Rock Point, 97, 649.

Submarine mines.

1893. Mining casemate nearly completed, 93, 8.

1898. Mines planted, 98, 22.

1899. Mining casemate at site No. 2 waterproofed. \$6,240 allotted for operating mine field and removal and storage of torpedo material, 99, 813. \$6,670 allotted for mining casemate, nearly finished. Summary and cost of work, 99, 816, 821. \$5,000 allotted for torpedo storehouse under contract, 99, 816. \$3,500 allotted for cable tank; completed, and crane erected. Summary and cost of work, 99, 817, 821.

1900. Estimate of \$9,550 for mining casemate at site No. 1 approved; no funds, 1900, 868. Casemate at site No. 3 practically completed, and torpedo storehouse built, 1900, 872. \$500 allotted for site No. 4; no expenditure as torpedo material was stored and cared for by Engineer force. \$1,000 allotted for supplies for seacoast defenses; no requisition as yet. 1900, 875.

BARRANCAS. (See Pensacola, Fla.)

BATTALION OF ENGINEERS. (See Post at Fort Totten.)

BATTERY BIENVENUE, LAKE BORGNE, LA. (See New Orleans, La., and Sabine Pass, Tex.)

BATTERY HUDSON. (See New York Harbor.)

BEAUFORT HARBOR. (See North Carolina.)

BIENVENUE. (See New Orleans, La., etc.)

BOSTON HARBOR, MASS.**Engineering features.**

Concrete, ingredients of, 1900, 775.

Concrete surfaces, exposed, protection of, during winter months, 99, 722.

Conduit system, underground, description of, 1900, 776.

Plant, central electric lighting, description of, 1900, 777, 779.

Waterproofing, description of, 1900, 775, 783.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 5; 67, 6; 68, 9; 69, 9; 70, 14; 71, 9; 72, 6; 73, 7; 74, 8; 75, 8; 76, 9; 77, 7; 78, 8; 79, 12; 80, 23; 81, 20; 82, 16; 83, 11; 84, 17; 85, 11; 86, 12; 91, 6; 92, 4; 93, 5; 94, 7; 95, 6; 96, 12, 469; 97, 12, 600; 98, 16, 592; 99, 18, 709; 1900, 15, 773.

BOARD OF ENGINEERS:

1862. Constituted to consider and report upon the condition of fortifications, and what number if any could be dispensed with. Report, 82, 416.

Estimates, 87, 11; 89, 6; 90, 5; 91, 5.

ENGINEERS IN CHARGE:

Maj. C. E. Blunt, 1866.

Col. H. W. Benham, 1866-1882.

Maj. F. E. Prime, 1870.

Col. G. E. Blunt, 1883.

Maj. C. W. Raymond, 1883-1886.

Lt. Col. G. L. Gillespie, 1886-1888.

Col. S. M. Mansfield, 1891-1899.

Col. C. R. Suter, 1899-1900.

ASSISTANTS:

Capt. S. S. Leach, 1891-1893.

Lt. M. L. Walker, 1897.

Lt. J. S. Sewell, 1897-1899.

Lt. R. R. Raymond, 1899-1900.

Lt. C. S. Bromwell, 1899-1900.

Forts and batteries. a—Operations.

Fort Warren (Georges Island).

1833. Work begun, 80, 23.

1866. Fort nearly completed according to original plans. Work modifying

casemated platforms to suit modern guns of heavy armament; interior finish of casemates for hospital purposes; preparing stone for main gateway; and drainage. 66, 6.

1867. Fittings of casemates completed; traverse circles with longer radii relaid on parapet of front 1; quarters and hospital finished; and minor work, 67, 6.

1868. 1 bomb-proof traverse on coverface of northeast front 2 built, another one nearly finished; work on scrap wall and arch of main gateway; repairs to drain, slopes, etc.; removal of old engineer buildings within the fort, and their reconstruction, 68, 9.

1869. Masonry and earthwork of bomb-proof traverse, front 2, completed; repairs to quarters, embankments, and casemates, etc.; modified plans prepared; estimated cost, \$402,400, 69, 9.

1870. Repairing leaks in coping of scrap wall, officers quarters, and renewing asphalt floors, and minor work, 70, 14.

1871. \$50,000 appropriated. Modification work begun; preparing demilune south of main work for larger ordnance; concrete masonry of two traverse magazines built; parade walls torn down and drains rebuilt; foundations of all piers for the new large arches completed; and minor work. 71, 9.

1872. \$85,000 appropriated. Removal of parade wall in bastion A completed; piers of all arches built; stone faces of the arch at the gorge and of arch over stairway completed; work on remaining arches in the bastion, and wing and sustaining wall on right of the gorge; masonry and earth cover of the parades completed; and minor work. 72, 7.

1873. \$40,000 appropriated. All new work in bastion A complete; bastion E masonry of two traverse magazines of its barbette completed, and minor work; demilune masonry of one platform com-

^aList of works as arranged under this head—

Fort Warren (Georges Island).

Fort Independence (Castle Island).

Provincetown Harbor, permanent forts.

Long Island Head Battery.

Fort Sewell (Marblehead).

Fort Andrew (Plymouth Harbor).

Fort Standish (Plymouth Harbor).

Fort Winthrop and batteries (Governors Island).

Emplacement for 8-inch guns, disappearing carriages.

Site 4.—Mortar battery for sixteen 12-inch mortars.

Site 1.—Emplacement for five 10-inch guns on disappearing carriages.

Site 5.—Emplacements for five 10-inch guns on disappearing carriages.

Site 1.—Two 4.72-inch emplacements for R. F. guns.

Site 2.—Two emplacements for 4.72-inch R. F. guns.

Site 4.—Three emplacements for 12-inch rifles, disappearing carriages.

Site 6.—Two emplacements for 12-inch rifles, nondisappearing carriages.

Site 1.—Two emplacements for 12-inch guns on disappearing carriages.

Site 1.—Three emplacements for 15-pounder R. F. battery.

Site 7.—Emplacement for 6-inch R. F. guns on disappearing carriages.

Site 6.—Two 6-inch R. F. guns on pillar mounts.

Site 2.—Two emplacements for 15-pounder R. F. guns.

Site 5.—Two emplacements for 6-inch R. F. guns, pedestal mounts.

Site 7.—Emplacements for two 15-pounder R. F. guns.

BOSTON HARBOR, MASS.

pleted, work on new sand parapet, and embankment of traverses and paradocs; minor work, 73, 7.

1874. Bastion A: Completion of five 15-inch gun platforms and their breast-height walls, masonry of two traverse magazines with connecting paradocs arch, and necessary doorways, staircases, etc.; work on earth cover, and sand parapet nearly completed. Bastion B: Completion of 2 15-inch gun platforms, a third nearly finished, foundation of new arch piers in parade completed. Bastion E: Paradocs arch built; work on 5 new gun platforms in demilune. Breast-height wall for entire battery built; minor work, 74, 9.

1875. \$25,000 appropriated. Battery for 5 15-inch guns finished to admit of armament being placed; 3,000 tons of sand placed in paradocs and cover of magazines; minor work, 75, 8.

1876. Completion of ravelin battery, and as far as possible of batteries of bastion A of the enciente; work on modifications of bastion B, 76, 9.

1877. Repairing earthen slopes, concrete and plastering of magazine arches in bastion B, drains, and asphalt cover, 76, 7.

1881. Repairs of slopes, casemates, drains, and ironwork, 81, 20.

1882-84. Repairs of slopes, drains, and buildings, 82, 16; 83, 11; 84, 17.

1885. Repairing sea wall, drains, and casemates; torpedoes painted, 10-inch and 15-inch platforms put in serviceable order; and minor repairs, 85, 11.

1886. Repairs of cisterns; hanging doors; extra traverse irons placed on 10-inch gun front pintle barbette platforms to adapt them to the new ordnance carriage for 8-inch converted rifles; steamer *Tourist* repaired, 86, 12.

1887. Estimates by Board of Engineers, for gun and mortar batteries, 87, 11.

Fort Independence (Castle Island).

1823. Work begun, 80, 24.

1866. Resetting gun platforms; flagging; cutting out and replacing new pintle for 21 barbette guns in main work; repairing breast-height wall and earthen parapet of northwest exterior battery, and building bomb-proof magazine chamber of this battery, 86, 6.

1868. Masonry, concrete, and earth covering of magazine of the northwest exterior battery completed; completion of masonry of southeast exterior battery bomb-proof traverse; masonry of adjacent magazine begun; parapet cut down; embankment at outer extremity of battery enlarged and raised, and minor work, 88, 10.

1869. Work on southeast exterior battery magazine, bomb-proof adjacent completed; slopes repaired, and minor work. Modified plans, 69, 10.

1870. Estimated cost of modifications, \$106,000. Earth covering and sodding of east battery magazine completed; repairing breaks in scarp wall and parade wall copings, 70, 15.

1871. \$27,500 appropriated. Modification work begun; necessary buildings for employees built; masonry of 2 new traverse magazines built; minor work, 71, 11.

1872. \$42,500 appropriated; breast-height walls of east, southeast, and north bastions completed; work on 6 platforms and breast-height walls of northwest bastion; excavation for sand parapet of fronts 1 and 2; minor work, 72, 8.

1873. \$35,000 appropriated; completion of masonry of 2 center pintle and 4 front pintle 15-inch gun platforms, with their breast-height walls; small magazines on front 1; masonry, earth slopes, and hoisting sand for east bastion; work on earth slopes, and excavation for sand parapet of east bastion and curtain of front 1, 73, 8.

1874. New barbette battery finished ready for armament; completion of new sand parapet, traverse magazines, parade on fronts 1 and 2, 2 traverse magazines on front 3, excavation for sand parapet, and minor work in east exterior battery, 74, 9.

1875. Modifications of the battery of the enciente nearly completed; 1 15-inch gun platform in east exterior battery finished; work on 2 others, with their breast-height walls, and new parapet in front of battery, 75, 9.

1876. Completion of proposed modifications of barbette battery of the enciente, of 5 platforms, ready for armament, in east exterior battery, and minor work, 76, 10.

1877. Care and preservation, 77, 7.

1881-84. Repairs of slopes, drains, and buildings, etc., 81, 22; 82, 17; 83, 13; 84, 19.

1885. Gun platforms put in serviceable condition, and repairs of buildings, wharves, etc., 85, 12.

1886. Doors hung; ironwork on 15-inch platforms painted; extra traverse irons placed on 10-inch gun platforms to adapt them to the 8-inch converted rifles, 86, 13.

1898. Castle Island turned over to the city of Boston for park purposes, act of May 1, 1890. Public excluded from fort and batteries, 98, 601.

1899. All explosives removed from the island and all torpedo material stored. The island again opened to the public, 99, 711.

BOSTON HARBOR, MASS.*Provincetown Harbor—Permanent Forts.*

1866. Defenses of this part of the coast to be considered by board of officers. Balance in Treasury, \$150,000. **66, 6.**

1867-70. Work awaiting the preparation of plans, **67, 6; 68, 10; 69, 10; 70, 15.**

Long Island Head Battery.

1869-70. Possession of this site, for defense of Broad Sound and the main ship channel, acquired by act of March 28, 1867. Project for barbette earthen battery for heavy guns, estimated cost, \$175,000. **69, 9; 70, 15.**

1871. \$37,500 appropriated. Work begun. Necessary buildings for employees built. **71, 10.**

1872. Work on wharf, excavation for the eastern mortar battery and paradoss in rear, concrete masonry of these positions, and drainage, **72, 7.**

1873. Completion of drain of eastern part of the battery, two large magazine cells and their connected paradoss arches, foundation of east salient gun platform and its breast-height wall, and excavation for the magazine and paradoss north of it; minor work. **73, 7.**

1874. \$40,000 appropriated. Completion of center-pintle, 15-inch gun platform at east salient of the battery, and masonry of adjacent magazine and paradoss. **74, 9.**

1875. \$30,000 appropriated. Work on embankment for traverse magazines and paradoss; completion of 6 15-inch gun platforms with their breast-height walls, minor work. **75, 8.**

1876. Completion of 4 15-inch front-pintle gun platforms with their breast-height walls, ready for armament. Work on paradoss. **76, 9.**

1877. Repairing drains, and grading terrepleins of two upper batteries to allow guns to be reversed. **77, 7.**

1881. Repairs made to buildings, gun carriages, etc. **81, 21.**

1882. Repairs to earth slopes and traverse magazines, buildings, etc. **82, 16.**

1885. Gun platforms put in serviceable order; minor repairs to buildings, fences, drains, and slopes. **85, 11.**

1886. Doors hung; repair of slopes, etc.; painting iron work of gun platforms. **86, 12.**

1887. Estimates by Board of Engineers for gun and mortar batteries. **87, 11.**

Fort Sewell (Marblehead).

1884. Fort built 1863-65. History and description, **84, 17.**

Fort Andrew (Plymouth Harbor).

1884. Fort built 1863-65. History and description. Site purchased 1870. **84, 19.**

Fort Standish (Plymouth Harbor).

1884. Fort built 1862-65. Description. Site purchased in 1870. **84, 19.**

Fort Winthrop and batteries (Governors Island).

1884. Existing work, consisting of a central casemated keep, and exterior earthen batteries begun in 1844. **80, 23.**

1866. Three bomb-proof south battery magazines completed, and slopes of east part of battery sodded, earthwork repaired, and bomb-proof traverse next west of the stone redoubt sodded; work on stone walls, entrance to second traverse magazine west of stone redoubt, south battery; repairing quarters, and minor work. **66, 6.**

1867. Earth covering and sodding of the west magazine, south battery, completed; parapet of south, east, and northwest batteries repaired and sodded; bluff below south battery graded and seeded; northeast and northwest bastions of the earthwork to surround the tower begun; tunnel covered way to south battery excavated; and concrete foundation of its walls laid. **67, 6.**

1868. Work on long covered way between the tower ditch and south battery; raising embankment of the bastions around the tower; repairing embankments of bomb-proof traverses; minor work. **68, 10.**

1869. Covered way completed, and bomb-proof traverse, opposite, built; earthen counterscarp slopes around tower finished; embankment repaired; minor work. Plans modified. **69, 10.**

1870. Estimated cost of modification \$130,000. Earth counterscarp slopes completed; west half of exterior earthwork of tower completed; communication between ditch of the tower and south battery completed; minor work. **70, 15.**

1871. \$45,500 appropriated. Modification work begun; concrete masonry, east battery, constructed; drainage and minor work; three traverse magazines, south battery improved and enlarged; parade reasphalted; and minor work. **71, 10.**

1872. \$64,000 appropriated; work on traverse magazine, platforms, breast-height wall, and sand parapet, east battery; breast-height wall for 4 gun positions, south battery, built; western magazines and shell room, and pit for mortar beds, completed. **72, 7.**

BOSTON HARBOR, MASS.—Continued.

1873. \$50,000 appropriated; completion of new platforms designed for ordnance carriages in east battery, and front-pintle platforms of south battery; work on breast-height wall platform, traverse magazine, and new parapet of south battery; mortar battery completed; and minor work. **73, 7.**

1874. Platform for forty-four 15-inch guns completed; sand parapet of east battery finished, and work on excavation for sand parapet of south battery; two new traverse magazines finished, work on a third. **74, 9.**

1875. Completion of masonry of breast-height walls, platforms of two 15-inch guns, necessary iron work of four others; work on breast-height walls for four gun positions. Battery, except new sand parapet, completed. **75, 9.**

1876. Completion of east and south batteries (comprising forty-three 15-inch gun platforms) excepting about one-half of new sand parapet of south battery. **76, 10.**

1877. Repair of slopes and drains. **77, 7.**

1881. Repairs of earth slopes, drains, and buildings; and painting iron work. **81, 21.**

1882-84. History, and condition. Repairs of slopes, etc. **82, 17; 83, 12; 84, 18.**

1885. Gun platforms put in serviceable condition; repair of slopes, parade of the tower, and buildings. **85, 12.**

1886. Doors hung; painting iron work of gun platforms; extra traverse irons placed on 10-inch gun platforms to adapt them to the new carriage for 8-inch converted rifles; drain of the tower cleaned and extended. **86, 13.**

Emplacement for 8-inch guns, disappearing carriages.

1891. One emplacement under construction, **91, 7.**

1892. Old masonry demolished, **92, 5.**

Site 4.—Mortar battery for sixteen 12-inch mortars.

1891. Work begun June, 1891, **91, 7.**

1892. \$121,039.27 allotted, 1891; excavation completed; 9,000 c. y. embankment built; 6,700 c. y. concrete placed, **92, 5.**

1893. \$10,000 allotted, masonry and earth embankment nearly completed, **93, 6.**

1894. Embankments and sodding completed, **94, 7.**

1895. Eight mortars mounted, work on four platforms, **95, 7.**

1896. \$2,786.50 allotted. All platforms finished, mortars mounted, and bat-

tery nearly finished. Turned over to artillery. **96, 12, 470.**

1897. Battery completed, **97, 602.**

1898. \$275 allotted for repairs of electric plant, **98, 595.**

1899. \$6,000 allotted for repairing slopes, electric plant, and for construction of power house, etc., **99, 713.**

1900. \$375 allotted for hanging doors, **1900, 781.**

Site 1.—Emplacement for five 10-inch guns on disappearing carriages.

1892. \$156,194.05 allotted 1890-91. Work on concrete masonry. **92, 5.**

1893. Work on three emplacements, 4,000 c. y. concrete placed, **93, 5.**

1894. Construction materials collected for two emplacements, some masonry built, **94, 7.**

1895. Three emplacements ready for guns, **95, 6.**

1896. \$53,138.16 allotted. Guns not yet received; some concrete work. **96, 470.**

1897. Two 10-inch carriages assembled; work on another one, **97, 601.**

1898. New project. One carriage assembled and three 10-inch guns mounted; some concrete work. \$74,000 allotted. Work begun on two other emplacements. **98, 593.**

1899. \$46,800 allotted. Three emplacements practically completed except minor work; work on two other emplacements nearly completed; the two guns and carriages received but not mounted. **99, 709, 720.**

1900. Guns and carriages mounted, completing the emplacements in all respects, **1900, 774.**

Site 2.—Emplacements for five 10-inch guns on disappearing carriages.

1893. \$58,000 allotted. Work begun December, 1892, 2,500 c. y. earth excavated and placed in embankment of one emplacement. **93, 6.**

1894. Masonry of one emplacement well advanced; materials collected and stored, **94, 7.**

1895. One emplacement ready for gun, **95, 6.**

1896. \$21,674.75 allotted. Emplacement completed. **96, 470.**

1897. \$197,200 allotted. New project; completion of emplacements 1, 2, and 3; excavation of emplacement number 4 nearly ready for concreting; work on excavation 5; four platforms ready for carriages and guns. **97, 601.**

1898. Work on excavation, parapet walls, ammunition service, electric-light plant; five guns and carriages mounted; battery nearly completed; \$4,000 allotted

BOSTON HARBOR, MASS.—Continued.

for commanders' stations, and foundations in place, 98, 594.

1899. Battery, except minor work, completed, 99, 712.

1900. Battery completed, 1900, 778.

Site 1.—Two emplacements for 4.72-inch R. F. guns.

1898. \$9,090 allotted. Work begun, excavations nearly completed; platforms ready for guns. 98, 593.

1899. Guns mounted, electric light installed, stairs built; minor work. Emplacements completed by July 1, 1899. 99, 720.

Site 2.—Two emplacements for 4.72-inch R. F. guns.

1898. \$14,740 allotted. Work begun, guns mounted, excavations finished, and concrete work in progress. 98, 594.

1899. Guns mounted and battery, excepting minor details, completed, 99, 722.

Site 4.—Three emplacements for 12-inch rifles, disappearing carriages.

1898. \$151,680 allotted. Work begun April, 1898; platforms ready for mounting guns; excavation completed, magazine work in progress. 98, 595.

1899. \$36,000 allotted. Battery practically completed; three carriages on hand. 99, 713, 721.

1900. \$23,800 allotted. Battery completed; guns mounted. 1900, 779, 780.

Site 6.—Two emplacements for 12-inch rifles, nondisappearing carriages.

1898. \$4,800 allotted for communication for range-finding service. \$80,000 allotted. Survey of site; excavation begun. 98, 596.

1899. \$27,000 allotted. Battery completed in all essential details. Part of one carriage received. 99, 722.

1900. \$8,960.30 allotted. Work on slopes, installation of electric lighting plant, permanent water supply, and minor work. 1900, 782.

Site 1.—Two emplacements for 12-inch guns on disappearing carriages.

1899. \$123,000 allotted. Concrete work begun. 99, 710.

1900. \$15,760 allotted. Emplacements completed excepting some work on platforms and mounting guns. 1900, 774.

Site 1.—Three emplacements for 15-pounder R. F. battery.

1899. \$9,300 allotted. Site laid out ready for excavation. 99, 711.

1900. \$3,450 allotted. Battery completed in all respects, electric lighting

system installed and guns mounted; work turned over to the garrison. 1900, 775.

Site 7.—Three emplacements for 6-inch R. F. guns on disappearing carriages.

1899. \$65,000 allotted. Preparation of plans for wharf and general construction plant in progress. 99, 715.

1900. Excavation, and about one-half of concrete work completed. Two carriages received. 1900, 784.

Site 6.—Two 5-inch R. F. guns on pillar mounts.

1899. \$11,500 allotted. Excavation begun and concrete carried up to the ceiling level. 99, 715.

1900. \$2,550 allotted. Battery completed, excepting setting hand rails. Carriages mounted. 1900, 783.

Site 2.—Two emplacements for 15-pounder R. F. guns.

1900. \$13,200 allotted. Work completed, excepting sodding slopes and providing ammunition lifts; no carriages or guns received. 1900, 779.

Site 5.—Two emplacements for 5-inch R. F. guns, pedestal mounts.

1900. \$20,000 allotted. Battery completed ready for armament; neither guns nor carriages received. 1900, 782.

Site 7.—Emplacements for two 15-pounder R. F. guns.

1900. \$12,000 allotted. Plans prepared and survey of site made. 1900, 784.

Miscellaneous.*Underground conduit system:*

1900. *Site 1.*—\$9,250 allotted; description of system. 3,000 f. of conduit laid. 1900, 776.

Site 2.—\$3,000 allotted; work completed 1900, 779.

Central electric lighting plant:

1900. *Site 1.*—\$10,000 allotted. Description of plant, installation of which was completed. 1900, 777.

Site 2.—\$6,300 allotted; work completed. Description of plant. 1900, 779.

Moving and mounting guns and carriages:

1900. *Site 1.*—\$1,100 allotted, two 10-inch guns and carriages moved from wharf to their emplacements, to be mounted by the garrison, 1900, 777.

Site 6.—\$1,200 allotted; two 12-inch carriages mounted; no guns on hand, 1900, 783.

Supplies for coast defenses:

1900. \$1,000 allotted for purchase of electrical supplies; none purchased, 1900, 791.

BOSTON HARBOR, MASS.—Continued.

Preservation and repair of fortifications.

1899. \$800 allotted for repair of 10-inch and 12-inch emplacements and \$200 allotted for relaying flagging. \$175 allotted for repairing bridge of old works, and \$2,200 for repair of wharf. 99, 717, 718.

1900. \$675 allotted for general repair of batteries and their power plant; \$300 allotted for general repairs of plant; \$4,250 allotted to prevent dampness in magazine at Site 2; \$210 allotted for demolition and removal of old buildings occupying ground required for other purposes; \$800 allotted for care and repair of plant; \$300 allotted for repairs at Site 4; \$1,000 allotted for repair and care of Site 5; \$1,860 allotted for general care and repair at Site 6; \$250 allotted for repairs at Site 7. 1900, 786-89.

Range and position finders.

1900. \$4,605 allotted; commander's station completed; \$8,400 allotted for two additional range-finder stations, Site 1, 1900, 776; \$1,385 allotted for commander's station at Site 2, completed, 1900, 778. Site 3.—\$6,400 allotted; work begun. 1900, 780.

Sites.

Groves Cliff:

50 acres acquired in 1891, 92, 9.

8 small lots acquired by purchase, 93, 10.

Total area acquired, 503 acres for \$263,597.79, 94, 13.

Battery for 8 12-inch mortars:

\$284,378.85 allotted to purchase sites, 97, 603.

Peddocks Island:

\$33,130 allotted for purchase of 33.13 acres, 98, 599.

Deer Island:

23.34 acres transferred by Boston to the

U. S.; more land wanted by U. S. City did not feel justified in transferring any more land at the time. 98, 600; 99, 719.

Nantasket Head:

\$251,248.85 allotted. About 40 acres acquired by purchase. 98, 600.

Nahant:

Report, as to desirable land, to be submitted later, 98, 600; 99, 719.

Description of land acquired, 99, 718; 1900, 789.

\$1,000 allotted for survey, 1900, 791.

Submarine mines.

1891. Two mining casemates completed, 91, 7.

1893. \$27,000 allotted. Work begun, third casemate. 93, 6.

1894. Masonry and entrance gallery completed; work on cable gallery and sand embankment, 94, 7.

1895. Masonry casemate and gallery of third casemate finished and sand cover nearly completed, 95, 7.

1897. \$4,300 allotted. Work on cable tank. 97, 602.

1898. Cable tank nearly completed; \$1,035 allotted for removal of torpedo material to place of operation; \$25,000 allotted for purchase of additional torpedo material; \$68,700 allotted for planting mines. Description of mines, material, and the planting. 98, 597. \$800 allotted for cleaning and painting mine cases, 98, 601.

1899. \$7,400 allotted for construction of 2 casemates; one begun; \$76,847.18 allotted for planting and removing mines, and purchasing and cleaning torpedo material, 99, 716, 723.

1900. \$2,000 allotted for mining casemates; \$850 allotted and a second casemate built; \$1,600 allotted. Torpedo material cleaned and stored. 1900, 785, 787.

BRIDGEPORT (Temporary Defenses at). (See *Eastern Entrance of Long Island Sound and Coast of Connecticut.*)

BRUNSWICK, GA. (Temporary Defense). (See *Georgia and Cumberland Sound.*)

BUFFALO, N. Y. (See *Lake Ports.*)

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 3; 67, 3; 68, 6.

ENGINEERS IN CHARGE:

Maj. J. A. Tardy, 1866-67.

Col. T. J. Cram, 1868.

Capt. F. Harwood, 1868.

1866. Additional works for defense to be considered by Board of officers, 66, 3.

1867. Operations awaiting result of experiments and the deliberations of the Board of Engineers upon the application of new material to purposes of defense, 67, 3.

CANBY. (See *Columbia River.*)

CAPE DISAPPOINTMENT, WASH. (See *Columbia River, Oreg. and Wash.*)

CAPE FEAR RIVER. (See *North Carolina.*)

CARROLL. (See *Baltimore, Md.*)

CASTLE ISLAND. (See *Boston Harbor, Mass.*)

CASTLE PINCKNEY, SHUTES FOLLY ISLAND. (See *South Carolina, Coast of.*)

CASTLE WILLIAM. (See *New York Harbor.*)

CASWELL. (See *North Carolina.*)

CLARKS POINT (FORT). (See *Southeast Coast of Massachusetts.*)

CLINCH. (See *Georgia.*)

COLUMBIA RIVER, OREG. AND WASH.

Contracts.

1897. Portland cement, 3,000 bbls., at \$2.18 per bbl.; broken stone, 65 cents per c. y. Wharf, \$9,302. 97, 762.

Electric-light stations.

1898. *Site No. 1*—683 c. y. concrete placed for foundations; wiring finished and station completed; description of plant, 98, 798.

Site No. 2—1,985 c. y. earth and 380 c. y. rock excavated for foundations; 400 c. y. concrete placed; building nearly completed, 98, 801.

1899. *Site No. 2*—Floors of the two rooms finished, work completed July 16, 1898, and turned over to the commanding officer, 99, 997.

1900. *Site No. 2*—Plant installed and in operation for direct lighting of the three 8-inch emplacements; storage battery received, ready for installation, 1900, 1022.

Engineering features.

Concrete mixing, cost of, 99, 1001.

Concrete parapets, top surface of, finishing of, 1900, 1025.

Condensation, controlling, method of, 1900, 1023.

Communication, system of, description, 99, 1003.

Cracks, to prevent, old railroad iron laid in concrete, 99, 995, 1002.

Cracks, concrete, linseed-oil filling, 99, 1003; repair of, 1900, 1023.

Granolithic finish, cost of, 99, 1001.

Materials, cost of, 97, 758, 761; 99, 1000.

Plant, construction, description of, 97, 756; 99, 1000.

Plant, concrete, description of, 97, 757.

Plant, electric, description of, 98, 798; 99, 997; 1900, 1022.

Sand for embankment, method of placing, 99, 1002.

Ventilating, system of, description, 1900, 1023.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 18; 68, 20; 69, 19; 70, 28; 71, 25; 72, 24; 73, 25; 74, 29; 75, 29; 76, 29; 77, 24; 78, 27; 79, 32; 80, 54; 81, 55; 82, 54; 83, 50; 84, 55; 85, 48; 86, 47; 96, 20; 97, 21, 756; 98, 30, 797; 99, 36, 993; 1900, 33, 1018.

BOARD OF ENGINEERS:

1882. Constituted to consider and report upon the construction of fortifications, and what number, if any, could be dispensed with, 82, 428.

ENGINEERS IN CHARGE:

Col. R. E. De Russey, 1866.
Maj. G. H. Elliott, 1866-69.
Maj. G. H. Mendell, 1870-71.
Maj. H. M. Robert, 1871-74.
Maj. N. Michler, 1874-76.
Maj. J. M. Wilson, 1876-78.
Maj. G. L. Gillespie, 1880-82.
Capt C. F. Powell, 1882-86.
Maj. J. C. Post, 1896.
Capt. H. Taylor, 1896.
Maj. W. L. Fisk, 1896-99.
Capt. W. C. Langfitt, 1900.
Capt. W. W. Harts, 1900.

ASSISTANT ENGINEERS:

Capt. C. W. Raymond, 1870.
Capt. H. Taylor, 1896.
Capt. A. F. Flagler, 1896-98.
Lt. W. D. Connor, 1898.
Lt. A. A. Fries, 1899-1900.

COLUMBIA RIVER, OREG. AND WASH.—Continued.

Forts and batteries.^a—Operations.

Fort Stevens, Oreg. (south side of river).

1869. Scarp revetment removed and exterior slope of parapet extended to bottom of ditch; covered way with parapet built along the counterscarp; minor repairs, 69, 19.

1870. 300 f. of facing of counterscarp relaid; slopes resodded, 70, 28.

1871. Picket fence erected, 71, 26.

1875. Postern of work repaired, 75, 28.

1876. New platform built for 15-inch gun, revetment in front renewed; revetment also renewed in front of one 10-inch and three 8-inch guns and the earthwork adjacent graded and sodded, 76, 29.

1877. Revetment of interior slopes renewed, old traverses renewed, and minor work; sea wall protection built, 77, 24.

1878. Shore protection built; minor repairs to gun platform and bridges, 78, 28.

1879. Drain to moat put in order, revetment of sally-port strengthened; the old lining of the passage leading to the magazine chamber strengthened, and a substantial interior waterproof lining added, 79, 33.

1880. Earth covering removed from sally-port; wooden drain to moat replaced by an 8-inch tile drain; minor work, 80, 54.

1881. Sally-port wholly rebuilt; revetment of traverses on both sides of 15-inch gun rebuilt and earth sodded; minor work, 81, 55.

1883. Repair of drains and moat; powder house built, work on breast-high plank walls, and shore protection, 83, 50.

1884. Marsh sod revetment of interior slope repaired; 4 shot platforms and 5 gun platforms built; work on magazine, 84, 55.

1885. Repair of magazine completed, 85, 48.

1886. 7 gun platforms rebuilt; minor work and repairs, 86, 48.

Cape Disappointment, Wash.

1870. Powder house, concrete foundation built, 70, 28.

1872. Painting powder house with fireproof paint, 72, 24.

Fort Canby, Wash. (north side of Chinook River).

1875. Two new gun platforms built, 75, 28.

1876. Magazines of west battery built, 10-inch gun platforms in east battery rebuilt, and new revetment placed in front, 76, 29.

1878. Main magazine painted, 78, 27.

1880. Revetment of interior slopes of center battery and part of revetment of right battery removed; platforms and revetment of 15-inch gun battery rebuilt; new roof built on powder magazine; minor work, 80, 54.

1881. Powder magazine painted, 81, 55.

1882. Rampart of center battery extended on the left and a platform placed for a 12-inch rifle received; repairs of breast-high plank walls; minor repairs, 82, 55.

1884. Service magazine and 3 gun platforms at center battery rebuilt; minor repairs made, 84, 55.

1885. Repair of service magazine and 2 gun platforms at the left of the battery; minor repairs in center battery and to the power house, 85, 48.

1886. 5 gun platforms built at the right battery, and shot beds at 3 batteries, 86, 48.

10-inch gun battery, 6 emplacements.

1897. Work begun Sept., 1896, for 4 emplacements; steam shovel, capacity 1½ c. y., bought; excavation and concrete work completed; 90,140 c. y. excavated and placed in parapet fill, completing it and parados; 3 guns and carriages received and mounted. Description of plant; itemized cost of construction materials, 97, 756.

1898. The other carriage and gun received and mounted; rear stairways built for the emplacements; hand rails put around the loading platforms; parapets, parados, and rear fills completed and sodded; 107,530 c. y. sand placed; 13,208 c. y. concrete placed in the 4 emplacements; 1,105 c. y. of this large rock

^a List of works as arranged under this head—

Fort Stevens, Oreg. (south side of river).

Cape Disappointment, Wash.

Fort Canby, Wash. (north side of Chinook River).

10-inch gun battery, six emplacements.

Two emplacements for 8-inch rifles.

Emplacements for eight 12-inch mortars.

Emplacement for one 8-inch rifle, experimental disappearing carriage, model 1894.

Site No. 1.—Two emplacements for 15-pounder R. F. guns.

Site No. 1.—Two emplacements for 6-inch R. F. guns.

Site No. 1.—Two emplacements for 6-inch rifles, disappearing carriage, model 1898.

Site No. 2.—Emplacements for 15-pounder R. F. guns.

Site No. 2.—Emplacements for 6-inch rifles, disappearing carriages, model 1898.

Site No. 1.—One emplacement for 15-pounder R. F. gun.

Site No. 2.—One emplacement for 15-pounder R. F. gun.

COLUMBIA RIVER, OREG. AND WASH.—Continued.

in pieces; drainage system completed. The 4 emplacements completed, except the steel cover for the observation station, with ammunition carriers, crane, etc., turned over to the commanding officer, Fort Canby, Mar. 18. 98, 797.

1899. \$25,000 allotted. Work begun, 1898, for two additional emplacements; 9,994 c. y. concrete placed; 25 t. old rails embedded in the concrete; 2 courses laid every 12 f. longitudinally and every 14 f. transversely to tie together the concrete mass to prevent cracks; 41,267 c. y. sand excavated and placed for parapet fill; machinery installed; emplacements practically completed, 99, 994.

1900. Connection made in rear of traverses between guns of emplacements 1-4 to allow ammunition to be taken from one platform to the next. Necessary changes made in platforms for floor plates of 18 in. instead of 12 in. One 10-inch disappearing carriage and two 10-inch guns received; the base ring set in emplacement No. 5 and the carriage and gun mounted by the artillery troops. The 2 A. R. F. emplacements, 5 and 6, turned over to the commanding officer June 28, 1900. 1900, 1019.

Two emplacements for eight-inch rifles.

1897. Work begun in 1896. Wharf nearly a mile long; built under contract for \$10,867.64; 10,905 c. y. excavated for foundations and necessary buildings; plant erected. Description of work of building wharf; itemized cost of construction materials. 97, 759.

1898. Concrete work begun July 7. 4,500 c. y. placed, and 15,860 c. y. earth excavated, including some excavation in front of the emplacements to secure the desired field of fire; 9,900 c. y. earth deposited as fill in the parapets; drainage system completed; 2 guns and carriages received and mounted, and apron placed after full settlement of parapet fill. 98, 800.

1899. Emplacements wired; lamps and switches put in. Several rooms and passages leak slightly because of cracks in parapet. 99, 997.

Emplacements for eight 12-inch mortars.

1898. Work begun in August. 6,173 c. y. concrete and 39,740 c. y. sand filling placed; drainage system completed; 7 carriages received and mounted; wiring for electric lights completed, and a storage battery of 52 cells, with switchboard, installed. Battery nearly completed. 98, 798.

1899. The other mortar carriage received and mounted. Granolithic finish placed on the pits, and the completed

battery turned over to the artillery on Jan. 17, 1899. Cracks appearing in the apron of each mortar pit, causing slight leaks in the shell rooms. 99, 996.

1900. Eight mortars mounted by the artillery in July. \$2,000 allotted for a new drainage system; work completed. 1900, 1020.

Emplacement for one 8-inch rifle, experimental disappearing carriage, model, 1894.

1898. Work begun in August. 5,615 c. y. excavated and 2,805 c. y. concrete placed, of which amount 17 per cent was large stone. Drainage system completed. 98, 800.

1899. Emplacement wired. Some trouble experienced from dampness and small leaks. 99, 997.

Site No. 1.—Two emplacements for 15-pounder R. F. guns.

1899. \$12,000 allotted. Some construction materials received. 99, 997.

1900. Work completed, including the wiring for electric light. 756 c. y. concrete placed and 3,384 c. y. sand placed in parapet. Fence built around battery. No armament received. Emplacements were turned over to the commanding officer June 28, 1900. 1900, 1020.

Site No. 1.—Two emplacements for 6-inch R. F. guns.

1899. Plans submitted, action deferred, kind of mount not definitely determined. 99, 998.

1900. \$15,000 allotted. No money to be expended till receipt of further instructions. Details of mount not perfected. 1900, 1024.

Site No. 1.—Two emplacements for 6-inch rifles, disappearing carriage, model, 1898.

1899. \$59,000 allotted. Construction materials received. 99, 998.

1900. Work begun, 4,342 c. y. concrete placed and 12,036 c. y. sand used for parapet fill. Drainage system installed; fence built around battery; carriages received and base rings set, carriages mounted by the artillery. Changes made in the system of electric lighting; rearrangement of the storage battery. \$1,500 allotted for a water supply system, work begun. Emplacements turned over to the commanding officer on June 28, 1900. 1900, 1020.

Site No. 2.—Two emplacements for 15-pounder R. F. guns.

1899. Revised plans approved. \$10,610 allotted. Sand for concrete received. 99, 998.

1900. Work begun in August, 1899. 7,755 c. y. excavated and 723 c. y. con-

COLUMBIA RIVER, OREG. AND WASH.—Continued.

crete placed. A macadam roadway built to connect with the 6-inch emplacement. Battery to be lighted from the electric-light plant in the 6-inch battery. No armament received. Emplacements turned over to the commanding officer on June 28, 1900. 1900, 1023.

Site No. 2.—Two emplacements for 6-inch rifles, disappearing carriages, model, 1898.

1899. Revised plans approved. \$57,600 allotted. Work begun clearing site of the battery. 99, 998.

1900. Work begun, excavation completed, 8,765 c. y. removed, 3,850 c. y. concrete placed, all drainage and water systems completed, all machinery installed, macadam roadway built connecting with the 15-pounder battery. Two carriages received and unloaded, then turned over to the artillery for mounting; work completed. Battery is designed to accommodate duplicate oil engine and dynamo, electric light and power plant, doing away with all outside wiring and the storage battery; contract made for this plant. Emplacements turned over to the commanding officer on June 28, 1900. 1900, 1022.

Site No. 1.—One emplacement for 15-pounder R. F. gun.

1900. \$5,450 allotted. Material advertised for. 1900, 1024.

Site No. 2.—One emplacement for 15-pounder R. F. gun.

1900. \$4,840 allotted. Materials advertised for. 1900, 1024.

Preservation and repair of fortifications.

1898. Two 10-inch S. B. guns dismounted and a new platform for a 15-inch front-pintle platform built on their site. Carriage received and mounted and the 15-inch S. B. gun moved from the old center-pintle platform and mounted on new carriage. The old jetty, shore, and wharf trestle repaired, 10,767 c. y. sand filling placed in the trestles; foundation of the water-supply tank renewed, new windmill tower built and a new well driven, 98, 800. Wharf and plant repaired, 98, 801.

South side of river: \$2,000 allotted, quarters and buildings repaired and a wooden platform for 15-inch Rodman S. B. gun built.

North side of river: \$150 allotted for repairs to powder magazine; a new tin roof placed, 98, 803.

1899. \$1,775 allotted. Old fort repaired, electric plants operated and cared for, storage batteries regularly charged,

new quarters built for accommodation of 180 men, and general repair of construction plant. 99, 996, 999.

1900. \$2,550 allotted. Cracks in the pits, aprons of the mortar battery and 8-inch battery partly repaired; method of work. \$1,410 allotted for care of electric-light plant and storage batteries. 1900, 1023.

Range and position finders.

1899. An 8-inch cast-iron pipe set in the concrete for a type B range finder, platform with pipe railing built around it for convenience in working the instrument, 99, 995.

1900. \$2,729 allotted for a battery commander's station, type A, for the 10-inch battery; station completed in May; given extra protection of concrete because of its exposed position. \$1,666 allotted for a battery commander's station, type A, for the 8-inch battery; work completed in May, 1900, 1021. \$225 allotted for mounting bases for type B, range and position finders, at two sites. One mounting was installed at the first site with a wooden stairway leading to it, and another mounted at the second site. 1900, 1022.

Sea walls and embankments.

Fort Stevens.

1,000 l. f. stone and brush revetment built to protect sea wall, 77, 24. New revetment of brush and stone and several small wing dams built along the shore of Point Adams. 78, 28.

Submarine mines.

1897. \$7,500 allotted. Work begun in April on a mining casemate. Railroad trestle 1,200 f. long built for transporting materials to site of work, 1,267 c. y. excavated, and 489 c. y. concrete placed, nearly completing the work. 97, 759. \$6,000 allotted for a second mining casemate, construction materials received. 1900, 762.

1898. *Site No. 1.—Mining casemate* completed, including 750 f. of gallery; 12,263 c. y. sand for protection and 718 c. y. concrete placed, 98, 798. \$2,000 allotted for a cable tank; work begun in April and completed in May. *Site No. 2.—Mining casemate:* 4,177 c. y. excavated, 635 c. y. concrete placed, work nearly completed, 98, 801. \$8,000 allotted for torpedo defense, materials received, and cables laid, but no mines planted. \$1,000 allotted for gun platforms; no money expended. 98, 802.

1899. *Site No. 1.—Mining casemate:* \$734 allotted for concrete culvert in place of the 12-inch cast-iron pipe, and for installing a blower; work completed, 99, 996. Second cable tank built, house built over it, the track for the overhead

COLUMBIA RIVER, OREG. AND WASH.—Continued.

traveler extended from the tank first built, 99, 996. \$5,800 allotted for a torpedo store house, which was completed, 99, 996. *Site No. 2.*—Mining casemate: \$1,885 allotted for altering casemate for the machinery required, work in progress, 99, 997. All torpedo material cleaned and stored, 2 searchlight outfits received, one set up and operated. 99, 999.

1900. *Site No. 1.*—Inside of casemate and engine rooms painted white, and a

blower provided, 1900, 1020. Torpedo storehouse: Steel roof trusses painted black and the ceilings and inside walls white; doors and windows were also painted, 1900, 1020. *Site No. 2.*—Mining casemate: Oil, engine, and dynamo room completed and a small blower provided, 1900, 1022. All torpedo material overhauled, cleaned, and stored. One drum of multiple cable found to have a defective core; new cable received. 1900, 1024.

COLUMBUS. (See *New York Harbor.*)**CONNECTICUT, COAST OF.** (See *Long Island Sound, etc.*)**CONSTITUTION.** (See *Portsmouth Harbor, N. H.*)**COW ISLAND BATTERIES.** (See *Maine Coast.*)**CUMBERLAND SOUND.** (See *Georgia and Cumberland Sound.*)**DABIEN, GA. (Temporary defenses).** (See *Georgia and Cumberland Sound.*)**DELAWARE BREAKWATER (New fort near).** (See *Delaware River.*)**DELAWARE RIVER.****Contracts.**

1895. Engines, boilers, generators, switchboard and testing apparatus of electric plant, \$2,975; electric locomotive, \$1,200; 2 electric derrick motors, \$1,800; 2 pile drivers, \$812; 2 concrete mixers at \$482; 1 naphtha launch, \$1,950, 95, 508.

1896. 15,000 bbls. Rosendale cement, 85 cents; 10,000 c. y. small broken stone, \$1.02; 3,000 tons large broken stone, 85 cents; 4,000 c. y. sand, 45 cents, 96, 487.

1897. 25,000 c. y. small broken stone, \$1.32; 9,000 tons large broken stone, 90 cents; 18,000 c. y. sand, 29½ cents; electric plant, \$5,089; 6 ammunition hoists, \$4,335, 97, 636.

1898. 150,000 c. y. embankment sand, 23½ cents; asphalt waterproofing, \$1.26 per s. y., in place; 15,000 c. y. small broken stone, \$1.23; 25,000 bbls. Rosendale cement, 71 cents; 75,000 c. y. building sand, 28 cents; 2,000 tons large broken stone, 85 cents; 1,300 bbls. Portland cement, \$2.15; 6,000 bbls. Rosendale cement, 80 cents; 1,250 bbls. Portland cement, \$2.20, 98, 645, 650, 653.

1899. 36,000 bbls. Rosendale cement, 68 cents; 24,000 c. y. small broken stone, 98 cents; 5,000 tons large broken stone, 73 cents; 9,000 c. y. washed sand, 28 cents; 18,000 c. y. unwashed sand, 24 cents; 163,659 lbs. steel beams, 1.4375 cents; 4,000 bbls. Portland cement, \$2.10; 127 bbls. Portland cement, \$2.50, 99, 788, 789, 800.

1900. 9,000 c. y. unwashed sand, 22

cents; 1,700 c. y. small broken stone, \$1.37; 1,000 bbls. Portland cement, \$2.21; 217 s. y. asphalt pavement, 1 inch thick, \$1.44; 1,006 s. y. asphalt pavement, 1½ inches thick, \$1.62; 3 chain ammunition hoists for 12-inch guns, \$1,080; 2 double chain ammunition hoists for 15-pounder guns, \$984; 1,600 c. y. small broken stone at \$1.56, 1900, 847, 852, 857, 864.

Engineering features.

Air spaces in concrete side walls 97, 631; 98, 786; 1900, 849.

Ammunition hoists, electric, 97, 631; 99, 784 (drawing), 795 (drawing); 1900, 853, 857.

Asphalt pavement, 1900, 849, 852.

Ceiling, construction of, 99, 786, 798; 1900, 843, 859.

Concrete, cost of, 97, 634; 98, 640, 642, 647, 652; 99, 792, 796, 799; 1900, 854.

Concrete of superior slope, 97, 630; 98, 651; 99, 798; 1900, 848, 854.

Concrete mixing plant, 97, 629; 99, 792 (drawing).

Materials, cost of, and of handling, 97, 633; 98, 640, 646, 652; 99, 792, 799; 1900, 853.

Cranes, ammunition, 1900, 850 (drawing).

Dampness in magazines corrected, 1900, 843, 859.

Doors, steel and brass, 99, 791 (drawing).

Earth and sand filling, cost of, 97, 634; 98, 640, 642, 647; 99, 792, 796, 799; 1900, 854.

DELAWARE RIVER—Continued.

Electric plant, light and power, 99, 795 (drawing); 1900, 850.

Electric plant used in construction work, unloading and transporting materials, 96, 485.

Employees, distribution in gangs on work, 97, 632.

Excavation, cost of, 97, 634; 98, 640, 647; 99, 796, 799; 1900, 855.

Expanded metal, 99, 787; 1900, 843, 859.

Latrines, 99, 798.

Mounting mortars, cost of, 98, 645.

Mounting 12-inch barbette guns and carriages, 1900, 861.

Mounting 12-inch disappearing guns and carriages, 98, 638.

Piles in place, cost of 1900, 854.

Plant, construction, 99, 792 (drawing).

Switchboard, 1900, 850 (drawing).

Tile for ceiling and walls, 99, 786; 1900, 849.

Ventilating, system of, 99, 787; 1900, 860.

Waterproofing, methods of, 98, 645, 652; 99, 783, 798; 1900, 849.

Wiring, electric, 98, 644; 1900, 850.

Work, amount of accomplished per gang (unloading, excavating, mixing concrete, etc.), 97, 633.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 12; 67, 12; 68, 14; 69, 14; 70, 20; 71, 16; 72, 13; 73, 13; 74, 15; 75, 16; 76, 16; 77, 13; 78, 15; 79, 19; 80, 33; 81, 33; 82, 30; 83, 26; 84, 31; 85, 25; 86, 25; 93, 8; 94, 9; 95, 8; 96, 15; 97, 14; 98, 20; 99, 22; 1900, 6, 20, 35.

BOARDS OF ENGINEERS.

1882. Constituted to consider and report upon the condition of fortifications and what number, if any, could be dispensed with. Report, 82, 420.

1887. The Board of Engineers estimated that one 16-mortar battery and two 12-inch disappearing guns could be built

on Pea Patch (island) for \$210,000; also estimated for 2 mining casemates, 87, 11.

1894. Report of Board constituted to consider and report upon price to be fixed for land in vicinity of Fort Mifflin authorized to be sold, 94, 461.

ENGINEERS IN CHARGE:

Col. H. Bache, 1865.

Lt. Col. C. S. Stewart, 1865-70.

Lt. Col. J. D. Kurtz, 1870-77.

Capt. Wm. Ludlow, 1877.

Col. J. N. Macomb, 1877-82.

Maj. Wm. Ludlow, 1882.

Lt. Col. G. Weitzel, 1882-84.

Lt. T. L. Casey, 1884.

Maj. W. H. Heur, 1884-85.

Lt. Col. H. M. Robert, 1885-90.

Lt. Col. C. W. Raymond, 1890-1900.

Lt. S. Cosby, 1900.

ASSISTANTS:

Lt. A. M. D'Armit, 1892.

Capt. S. Cosby, 1894-1900.

Lt. S. Cheney, 1897-98.

Lt. F. W. Altstaetter, 1898.

Lt. J. B. Cavanaugh, 1900.

Forts and batteries. a—Operations.

Fort Du Pont, Del. (new fort opposite Fort Delaware).—Earthen barbette battery.

1866-68. Study of defenses for this position to be entered upon, 66, 12. Commencement of operations deferred, 67, 11; 68, 15.

1870. Project for earthen battery to mount 20 guns prepared and approved. Appropriation asked for acquisition of site and completion of work. 70, 21.

1871. Measures taken to acquire site; proposed work specified, 71, 17.

1872. Site acquired; temporary buildings, etc., erected and wharf begun, 72, 14.

1873. Wharf and roadway leading to it built; dike nearly completed; embankment of battery commenced, 73, 14.

1874. Dike completed; right wing of

^aList of works as arranged under this head—

Fort Dupont, Del.—new fort opposite Fort Delaware.

Delaware Breakwater (new fort near).

Fort Delaware, Del.

Fort Mifflin, Pa.

Fort Mott, N. J. (Finns Point).

Fort Mifflin, Pa. (mortar battery).

Mortar battery at Finns Point.

Mortar battery near Delaware City, Del.

Battery on Delaware shore.

Red Bank, N. J. (site for the defenses at).

Three-gun lift battery (battery for three 12-inch guns on disappearing carriages).

Battery of three 10-inch and three 12-inch disappearing guns.

Battery for two 5-inch R. F. guns on balanced pillar mounts.

Mortar battery.

Two emplacements for 8-inch disappearing guns.

Two emplacements for 12-inch B. L. rifles on barbette carriages.

Emplacements for two 4.2 R. F. guns.

Emplacements for 15-pounder R. F. guns, two on left flank and two on right flank of 12-inch disappearing gun battery.

Emplacements for two 5-inch R. F. guns, wire wound, located on left flank of 10-inch and 12-inch battery.

Emplacements for two 5-inch R. F. guns, wire wound, located between river and mortar battery.

DELAWARE RIVER—Continued.

battery partly constructed; wooden platforms for 2 15-inch guns laid; embankment in front of battery continued; fencing completed; 3 temporary platforms for 10-inch guns constructed, 74, 17.

1875. Breast-height wall and parapet partly finished; 2 magazines completed; 4 wooden platforms laid; embankment raised for 400 f., 75, 17.

1876. 2 magazines completed; breast-height wall continued; torpedo casemate and cable gallery constructed; ramp formed; embankment continued, 76, 18.

1877. Operations of little importance beyond care and preservation of property, 77, 14.

1878. Severe storm entirely swept away top of dike; no work done except for care and preservation, 78, 17.

1879. Résumé of work accomplished to date; fences and bridge carried away by storm tide rebuilt; slight repairs executed, 79, 21.

1880. Appropriation recommended for continuing work; well dry; property cared for, 80, 37.

1881. Wharf repaired, 81, 36.

1882. Buildings repaired, 82, 33.

1883-84. No work done, 83, 29; 84, 34.

1885-86. Slight repairs made, 85, 28; 86, 27.

Delaware Breakwater (new fort near).

1866. Fort to be made subject of study by board, 66, 12.

1867-68. Work soon to be begun, 67, 11; 68, 15.

1869. Project to be prepared, 69, 14.

Fort Delaware, Del. (stone fort).

1866. Various minor works of construction carried on, dock wall built for 195 f., glacis completed, 66, 12.

1867. Dock wall extended 158 f.; repairs made to parade wall, glacis, embankment of the island, quarters, etc., 67, 11.

1868. Dock walls, and ditches extended, sluiceways finished, embankment and quarters repaired, 68, 14, 15.

1869. Minor repairs made to platforms, wharves, etc.; proposed to modify bastions of work to furnish emplacements for heavy guns, 69, 14.

1870. Slight repairs made; appropriation made by Congress to carry out approved project; work requires permanent wharf; dock walls to be completed, and large repairs to levees, 70, 20.

1871. Six magazines for large guns constructed of concrete; traverses begun; levee rebuilt for 2,450 f.; stone revetment relaid, and main ditch repaired. Future works specified, 71, 16.

1872. Nine magazines and traverses

finished on terreplein; minor work and repairs executed; observations on force and direction of current completed, 72, 13.

1873. Two barbette platforms for 15-inch guns, with breast-height walls, completed; wharf head temporarily rebuilt; proposed work mentioned, 73, 14.

1874. Three remaining platforms for 15-inch guns put down; extensive work done on magazines; iron balconies, etc., of barbette; iron shield used for experimental firing removed; ditches, dike, and wharves repaired, 74, 16.

1875. Breach made by experimental firing repaired; iron balconies built in rear of traverses; stone superstructure commenced for eastern wharf, 75, 16.

1876. Small amount available applied to repairs most necessary on wharves, flagging, buildings, etc., 76, 17.

1877. Damages to wharf and dike caused by severe storm repaired; temporary repairs made to upper wharf, 77, 13.

1878. Operations confined to care and preservation of property and slight repairs, 78, 16.

1879. Island submerged and great damage done by storm; dikes repaired; ditches cleaned; bridges, sluice gate, etc., rebuilt, 79, 19.

Report made Nov. 6, 1878, by Col. J. N. Macomb, on the storm of Oct. 23, 1878. The wind blew from the S. and E. with a velocity at times of 70 miles per hour, and the water rose to a height of 11 f. 7 in. above l. w., causing the highest tide ever known. Of the 31 buildings exterior to the fort 12 were destroyed and the remainder much damaged. All bridges except one were destroyed. \$11,-850 was estimated as the total cost for protection of this site from overflow. Record of occasional full tides since 1871. 79, 238, 243.

1880-82. Site of work and condition described, also repairs needed; modifications urged; minor repairs made, 80, 35; 81, 35; 82, 32.

1883. Site and importance described; nothing done, 83, 28.

1884. General repairs made, 84, 33.

1885. Repairs made to bridges, slopes, fences, buildings, and masonry of platforms; 25 barbette platforms modified to adapt them to modern iron carriages, 85, 26.

1886. 2 platforms modified, and 7 leveled; small repairs to grounds and ditches, 86, 26.

1898. Special allotment of \$6,000 made to clean moat and ditches of island, work deferred, 98, 643.

1899. Authority obtained to do work by hired labor; 14,110 c. y. removed from ditches, and 6,120 c. y. from moat; methods described, 99, 802.

DELAWARE RIVER—Continued.

Fort Mifflin, Pa. (old stone fort).

1866. Platforms altered, magazine built, and sundry repairs made, 66, 12.

1867. Magazine completed, new traverse stones put in platforms, and ditch cleaned, 67, 11.

1868. Changes made in and about magazine; ditches cleaned; wharf, sluice, etc., repaired; operations contemplated for future, 68, 14.

1869. Necessary small repairs made; alterations proposed, at an estimated cost of \$107,000, to furnish additional emplacement and to construct a new earthen battery for heavy guns, 69, 14.

1870. Appropriation made to carry out proposed plans and work to be carried on rapidly; no expenditure during year, except for care of property, 70, 20.

1871. 2 small service magazines completed; various repairs made to dikes, roads, bridges, ditches, 15-in. platforms, buildings, etc.; new sluice constructed; future work specified, 71, 16.

1872. 1,700 f. of dike reconstructed; minor work and repairs executed, 72, 13.

1873. Stone revetment placed along dike of back channel; construction material received; minor repairs and work executed; appropriation of \$55,000 asked for; work proposed for ensuing two fiscal years. Fort will be prepared during the year to mount 17 large guns. 73, 13.

1874. South battery of demilune completed; dike along south boundary finished; exterior battery partly embanked and graded; various repairs executed, 74, 15.

1875. Exterior battery for 9 guns embanked and slope graded; 6 stone platforms made ready, 75, 16.

1876. 9 wooden platforms laid; masonry of part of breast-height walls and of 2 magazines completed; 700 c. y. of sand embanked in battery; dike, slopes, and moat repaired, 76, 16.

1877. A few minor repairs executed; no appropriation made, 77, 13; 78, 15.

1879. Breaches in dike and other damages caused by severe storm repaired; plans for adapting works for modern heavy ordnance were prepared by Board of Engineers, but only partly completed, 79, 19.

Report made Nov. 13, 1878, by Col. J. N. Macomb, on the storm of Oct. 23, 1878, which was, in severity, almost without parallel. The tide attained the unprecedented height of 11 f. 3 in. above l. w., accompanied with wind blowing from ENE., veering to ESE., and to S., with a velocity of 49 to 72 miles per hour. Dikes breached and badly washed, 4 bridges lifted from position and floated

away, many buildings were destroyed, floor of main magazine, torpedo casemate and other magazines submerged. The greatest depth of water on the parade ground of the fort was 4 f. 9 in.; \$6,600 was estimated as the total cost for protection from overflow of the sites of fortifications. 79, 237.

1880-81. Short history of fort given; present condition described; no work done except for protection and repair, 80, 33; 81, 33.

1882. Extensive repairs made to dikes; sluices, parapet, bridges, and buildings repaired; fog bell erected on wharf, 82, 30.

1883-86. General repairs made, 83, 27; 84, 31; 85, 25; 86, 25.

1894. Sale of land in vicinity authorized and board appointed to report upon price and conditions of sale, 94, 9, 461.

1896. Damage done to wharf and banks by storms in 1893, 1894, and 1896; portion of reservation assigned to Navy Dept. for magazine purposes, another portion leased to Mrs. M. M. Black; \$3,000 to be expended from river and harbor appropriation in rebuilding and enlarging dike, 96, 487.

1897. Work on dike placed under contract and completed, 97, 639.

1898. 280 f. of dike repaired, and sluice renewed, 98, 657.

1899. Washout in 1,080 f. of bank filled in; 370 f. raised and revetted; total cost, \$1,196, 99, 794.

Fort Mott, N. J. (Finns Point)—Barbette earthen (10-gun) battery, opposite Fort Delaware.

1866-67. Slight repairs made, 66, 12; 67, 11.

1869. Proposed to construct earthen battery for guns of largest caliber, 69, 14.

1870. Appropriation granted for project for powerful earthen battery, 70, 20.

1871. Construction delayed for want of act of cession of jurisdiction by New Jersey, 71, 16.

1872. Jurisdiction to site perfected; preparations for active operations begun, 72, 13.

1873. Wharf nearly completed, temporary buildings built; roads, fences, and dikes worked on; embankment of battery commenced, 73, 14.

1874. Wharf completed; embankment of parapet continued; magazine begun; dike extended; 2 temporary platforms for 15-inch guns and 3 for 10-inch guns placed, 74, 16.

1875. Magazine and shelter room completed; 2 wooden platforms laid, and

DELAWARE RIVER—Continued.

construction of 2 stone platforms begun; embankment continued; sea wall extended, **75, 17.**

1876. 2 stone platforms completed and 2 others begun; 1 magazine built; embankment continued; sea wall rebuilt; fences extended, **76, 18.**

1877. 2 stone platforms finished; small amount of work done on sea wall, breast-height wall, and slopes, **77, 14.**

1878. A few minor repairs made, **78, 17.**

1879. Great damage done by October storm; partial repairs made to dike and retaining walls, **79, 20.**

1880-82. Works in poor condition; small necessary repairs made, **80, 36; 81, 35; 82, 32.**

1883-84. Part of sea walls repaired and raised; continuation of work urged, **83, 28; 84, 33.**

1885. Stone placed along shore where eroded, **85, 27; 86, 27.**

Fort Mifflin, Pa. (mortar battery).

1871. \$21,000 apportioned to the harbor of Philadelphia for emplacement of 6 mortars, **71, 26.** Proposed to build battery for 6 mortars south of fort. **71, 16.**

1872. Masonry for 2 service magazines carried forward, **72, 13.**

1873. Magazines loaded to test soil; sand placed in parapet, **73, 13.**

1874. Minor work and repairs executed, **74, 16.**

1875-79. No work done for lack of funds, **75, 16; 76, 16; 77, 13; 78, 16; 79, 19.**

1880-86. Site of battery and work done described; no work since 1874, **80, 34; 81, 34; 82, 31; 83, 27; 84, 32; 85, 26; 86, 25.**

Mortar Battery at Finns Point, N. J.

1872. \$20,000 allotted for 6 mortars, **72, 24.**

1873. Work commenced 1872; terreplein partly embanked, foundations of 2 magazines put in and side walls brought up 2 f.; funds derived from the general appropriation for mortar batteries, **73, 14.**

1874. Sea wall completed; terreplein embanked; masonry of 2 magazines finished; positions of 3 platforms temporarily occupied by 10-inch guns, **74, 17.**

1875-78. No operations for want of funds, **75, 17; 76, 18; 77, 14; 78, 17.**

1879. Report made Nov. 6, 1878, by Col. J. N. Macomb on the storm of Oct. 23, 1878. The wind blew from the S. and E. with a velocity of 70 miles per hour. The water rose to the unprecedented height of 11 f. 5 in. above l. w. Sea walls, wharf, and buildings partly destroyed.

Estimated cost of repairs and modifications, \$19,560. Record of occasional full tides since 1871. **79, 240, 243.**

1879-81. Résumé of work done; magazines in good condition, but sea wall and embankments badly damaged, **79, 20; 80, 36; 81, 36.**

1882. Work remains in incomplete condition, **82, 33; 83, 29; 84, 34; 85, 27, 86, 27.**

Mortar battery near Delaware City, Del.

1872. \$20,000 allotted to fort opposite Fort Delaware for 6 mortars, **72, 24.**

1873. Work commenced in Dec., 1872. Embankment begun, foundations of magazines put in, and side walls commenced. **73, 15.**

1874. Terreplein formed; 2 magazines nearly completed; parapet nearly embanked; 3 10-inch guns mounted temporarily, **74, 17.**

1875-76. No work for lack of funds, **75, 18; 76, 18.**

1877. Two unfinished magazines completed, **77, 14.**

1878. No work done for lack of funds, **78, 17.**

1879-84. Résumé of work accomplished to date; no work done for lack of funds, **79, 21; 80, 37; 81, 36; 82, 33; 83, 30; 84, 34.**

1885. Work incomplete and damaged, **85, 28; 86, 28.**

Battery on Delaware shore.

1879. Report made Nov. 6, 1878, by Col. J. N. Macomb on the storm of Oct. 23, 1878. The wind blew from the S. and E. with a velocity of 70 miles per hour. The water rose to the unprecedented height of 11 f. 5 in. The fencing and bridges were carried away and the wharf and roadway injured. A vessel of 80 t. was beached upon the outer slope of the battery. \$5,030 was the estimated cost of repairs and modification. Record of occasional full tides since 1871. **79, 238, 242.**

Red Bank, N. J. (site for the defenses at).

1873. Site surveyed and plot prepared. Act giving consent of State of New Jersey to purchase of land approved. Position of great importance, **73, 13, 14.**

1874-78. Repairs made to dikes, buildings, sluices, and fences, **74, 16; 75, 16; 76, 17; 77, 13; 78, 16.**

1879. No works constructed on site for lack of funds; dikes injured by storms, and partly repaired, **79, 19.**

1880-81. Site described, and history mentioned; dike repaired, **80, 35; 81, 34.**

DELAWARE RIVER—Continued.

1882-83. Site described, 82, 31; 83, 27.

1884. Site and conditions described, 84, 32.

1885. Dikes repaired, and shore protected, 85, 28; 86, 26.

1896. Meadow banks breached by storm in 1893, no injury to Government property; reservation leased to Mr. C. Whitall; \$2,500 from river and harbor appropriation to be spent in rebuilding dike, 96, 488.

1897. Work on dike placed under contract, and completed, 97, 639.

Three-gun lift battery (battery for three 12-inch guns on disappearing carriages.)

1895. \$260,000 allotted for construction. Old works on site removed and contracts entered into for material and plant; drawings nearly completed. 95, 8. Preliminary work done; contracts made for concrete plant, pile drivers, piles, engines, etc.; trolley line constructed and naphtha launch purchased. 95, 50.

1896. \$120,000 withdrawn from allotment. 10,922 c. y. excavated for foundations; 3,810 piles driven; officers quarters torn down; work suspended during summer; electric plant described. 96, 483.

1897. Project for battery of 3 12-inch disappearing guns to replace gun-lift battery approved; estimated cost \$357,200; pile driving practically completed, 4,582 piles in all being driven; large part of plant used on other work; 97, 636.

1898. \$58,000 allotted to complete concrete foundations, \$10,000 withdrawn; remaining piles driven; slip dredged; pile heads cut off; 10,338 c. y. of concrete placed in foundation; sewer built; 3,970 c. y. of sand placed in filling; detailed table given showing cost of concrete and filling, 98, 641.

1899. Allotment made of \$150,000 for construction of battery; plans remodeled and contracts for materials entered into; concrete work prosecuted vigorously, 13,682 c. y. being placed; ceiling and side-wall construction, ventilating and water-supply systems described; 2,385 c. y. sand and 3,020 c. y. of other filling placed; part of 1 gun carriage received; abstract of proposals given, 99, 785.

1900. \$12,500 allotted to complete battery; concrete work completed, 30,811 c. y. in all being placed; 2,509 s. y. of superior slope carefully paved; walls faced with tile; asphalt waterproofing placed; filling in front completed, 17,646 c. y. material being used; electric wiring installed, also ventilating system, trolley, drainage and water-supply systems, am-

munition cranes, iron stairways and balconies; electric plant moved to permanent power house; tracks laid; parade graded and flagstone pavements laid; many doors hung; 3 guns and carriages received, unloaded, and mounted at total cost of \$3,858; old ordnance sold; detailed tables given showing cost of materials and handling and of work, 1900, 847. Ammunition hoists contracted for, 1900, 853.

Battery of three 10-inch and three 12-inch disappearing guns.

1896. \$70,000 allotted for construction; site surveyed and test pits dug; machinery, derricks, cars, tracks, tools, lumber, and concrete material purchased; wharf and meadow bank repaired; concrete plant constructed; 1,500 c. y. excavated for foundations; 1,706 c. y. concrete placed; wharf extended, 96, 486.

1897. Estimated cost of 3 12-inch emplacements is \$168,400; of 3 10-inch emplacements, \$120,000; of parados, \$13,750; of road, \$3,500; additional allotment made of \$274,680, from which \$25,000 withdrawn; wharf described; battery proper completed; general description given of emplacements, 10-inch containing 15,606 c. y. of concrete, and 12-inch 21,918 c. y.; plant for mixing and placing concrete described in detail; composition of concrete, ceiling construction, air spaces in walls described; roadway begun and parados projected; systems for handling ammunition, and for electric lighting and power described; 3 10-inch guns and carriages mounted; detailed tables given showing distribution of employees on work, and cost of labor and materials, 97, 628-636.

1898. Roadway, electric system, ammunition hoists, latrines, and telephone booths completed; 33,984 c. y. of earth and sand placed in parados; construction plant torn down and removed; 3 12-inch guns and carriages received and mounted; method of mounting described; troops for garrison arrived, 98, 637.

1899. 6,379 c. y. material placed in parados; work twice interrupted; sluiceway of ditch extended; minor work done on battery; leakage into shot chambers stopped; 5 guns fired, but no target practice; drawing shown of 10-inch ammunition hoist, 99, 782.

1900. Battery turned over to artillery Jan. 6, 1899; parados completed, containing 44,500 c. y., and slopes graded; minor work of maintenance done on battery, 1900, 842. Expanded metal ceilings hung to correct dampness in magazines; bracketed gallery erected to connect the 6 platforms; board fence built

DELAWARE RIVER—Continued.

in rear; tools and supplies purchased, 1900, 843. Slopes of paradocs repaired; electric plant cared for. 1900, 844.

Battery for two 5-inch R. F. guns on balanced pillar mounts.

1897. Battery to be built beyond western end of main battery at estimated cost of \$20,000; excavation for foundations nearly completed, 97, 636.

1898. Completed in August, 1897; general features of battery and of electric system described; 2 emplacements contain 2,266 c. y. of masonry, and embankment 6,944 c. y. of earth; total cost \$19,529; table given showing cost in detail, 98, 639.

1899. Installation of searchlight plant completed, 99, 784.

1900. Guns and carriages not yet received; platforms cut down and paved, 1900, 842. Expanded metal ceilings placed in magazines. 1900, 843.

Mortar battery.

1897. Battery for 16 12-inch mortars to be built at estimated cost of \$247,180; \$175,000 allotted; proposals issued wharf extended 336 f., 97, 638.

1898. Wharf repaired and extended and transfer bridge built; site of battery prepared; methods of handling stone, sand, and concrete described; 22,082 c. y. placed in embankment; masonry practically completed, 15,511 c. y. of concrete being placed; electric-lighting system, waterproofing and pump room completed; 16 carriages and 8 mortars mounted at cost of \$4,619; detailed tables given showing cost of materials and handling, 98, 643.

1899. Height of earth cover reduced and estimate of cost revised; \$17,500 allotted and \$25,344 transferred from another work; storage battery set up; metal doors, telephone circuits, and observation station erected; 91,650 c. y. sand placed in embankment and faced with earth; blast aprons built; arrangement of construction plant described; battery practically completed; list of expenditures given, 99, 790.

1900. Embankment completed; main drain extended and valve placed at outlet; grounds graded and tracks laid; iron stairway and water tank erected; surface drain laid to prevent flooding of galleries; expanded metal ceilings constructed in magazines and electric fans installed, storage battery used, 1900, 858.

Two emplacements for 8-inch disappearing guns.

1898. \$74,000 allotted for construction from appropriation for "National Defense;" agreements entered into for

open market purchase of materials required; work begun on Mar. 21, 1898; 944 c. y. excavated for foundations; concrete rapidly placed, platforms constructed first, and both guns and carriages mounted by May 18; masonry completed June 8; 8,340 c. y. concrete being placed; waterproofing and electric system completed; expenditures given in detail, 98, 650.

1899. \$6,000 withdrawn from allotment; embankment begun and completed, 10,737 c. y. sand and earth being placed in it; electric plant and hoists installed and described; battery reported completed Jan. 1, 1899, and turned over to artillery on Jan. 12; rifles and carriages tested, one carriage damaged; cost of battery shown in detail, 99, 794.

1900. Electric plant cared for; earthen slopes repaired; ironwork painted, 1900, 862.

Two emplacements for 12-inch B. L. rifles on barbette carriages.

1898. \$80,000 allotted for construction from appropriation for "National Defense;" estimated cost, \$93,000; delivery of construction materials arranged for; 1,330 c. y. excavated for foundations; concrete construction begun and 6,419 c. y. placed; one platform completed; waterproofing and embankment begun, 98, 653.

1899. Both emplacements completed, containing 9,288 c. y. Rosendale and 659 c. y. Portland concrete; general details of construction given; waterproofing described; latrines constructed; embankment completed, containing 22,278 c. y. material; emplacements completed and turned over to artillery Jan. 12, 1899; two guns and carriages received and mounting begun; cost of battery given in detail, 99, 797.

1900. \$1,500 allotted for mounting guns and carriages; defects discovered in carriages repaired; additional defects found; mounting completed at cost of \$1,208, 1900, 861. Electric plant cared for and repairs made; earthen slopes repaired, 1900, 862.

Emplacements for two 4.72 R. F. guns.

1898. \$19,750 allotted from appropriation for "National Defense;" temporary platforms erected on barbette of old fort and guns mounted 12 days after arrival; project approved for permanent emplacements; site and general design described; plant set up and materials ordered, 98, 654.

1899. Foundations excavated, and 206 piles driven; 1,325 c. y. concrete and 7,000 c. y. sand and earth placed; settlement took place in embankment and en-

DELAWARE RIVER—Continued.

trances; battery completed and guns mounted; embankment leveled up; buildings moved out of line of fire; expenditures shown in detail, 99, 800.

Emplacements for 15-pounder R. F. guns, two on left flank and two on right flank of 12-inch disappearing gun battery.

1899. Allotments made for construction of \$3,800 and \$4,000 respectively; sites cleared and small amount of concrete placed, 99, 790.

1900. Emplacements form part of 12-inch battery; concrete of all emplacements completed except over small part of platforms; pavements, wiring, electric fans, and iron stairways put in place; ammunition hoists contracted for, 1900, 857.

Emplacements for two 5-inch R. F. guns, wire wound, located on left flank of 10-inch and 12-inch battery.

1900. \$17,500 allotted for construction; derricks set up; construction materials purchased and stored; proposals given in detail, 1900, 845.

Emplacements for two 5-inch R. F. guns, wire wound, located between river and mortar battery.

1900. \$15,900 allotted for construction; locomotive repaired; small construction plant erected; 380 c. y. material excavated for foundations; Rosendale and Portland concrete placed, completing masonry of south emplacement; 4,864 c. y. sand placed under masonry and in front embankment, 1900, 863.

Preservation and repair.

1898. \$325 allotted; fences repaired, sluice gates ordered, 98, 650.

1899. Allotments of \$945 and \$150; electric plant cared for by skilled mechanic, 99, 785, 798. \$1,150 allotted; river bank, sluices, roadway, and sea wall repaired, 99, 793.

1900. Under various allotments, tools and supplies purchased, electric plant cared for, river banks and wharf repaired, and other work done, 1900, 843, 844. Wharves filled in, cement purchased, walls of old fort repaired, 1900, 856. Under various allotments, electric plant of 8 and 12 inch battery cared for and repaired, wharf repaired, ironwork of mortar battery painted, earthen slopes repaired, 1900, 862. \$300 allotted for repair of river banks; banks placed in good condition. 1900, 865.

Range and position finders.

Under allotment of \$25 tide gauges constructed, and station of type B depression

range finder near mortar battery changed, 1900, 862.

Sea walls and embankments.*Fort Delaware, Del.:*

Embankment around Fort Delaware island repaired, 66, 12; 67, 11; 68, 15. Large repairs needed as levees seriously damaged by storm, 70, 20. Repairs made, 71, 16. South dike damaged by severe storm and repaired, 77, 13. Island submerged and dike breached by unprecedentedly high storm tide in Oct., 1878, damage repaired; estimate submitted for raising dikes to 13 f., 79, 20. Dikes restored to original height of 11 f. 80, 35.

Fort Mifflin:

River wall repaired, 68, 14. 1,700 f. reconstructed, 72, 13. Dike breached by storm of Oct., 1878, damages repaired; height and dimensions reported inadequate; estimate submitted for raising and revetting, 79, 19. Dredgings placed on dikes above naval wharf, 80, 34. Extensive repairs made to dikes, 82, 30. Parts of dike thoroughly repaired, 84, 32; 85, 25. Meadow banks damaged by severe storms, 96, 487. Under contract, 2,100 f. of dike on reservation were rebuilt and repaired, payment of \$3,000 being made from river and harbor appropriations, 97, 639. 280 f. of dike repaired, and leaks stopped in main bank, 98, 657. 1,080 f. repaired and 370 f. raised and revetted. 99, 794.

Fort Mott, N. J.:

Dike in front of reservation worked on, 73, 14. Extended from wharf south to boundary line; sea wall of mortar battery completed, 74, 16. 530 f. built and 120 f. rebuilt, 75, 17. Sea wall south of wharf entirely rebuilt on pile foundation, 76, 18. Great damage done by October storm, 1878; dikes partly repaired, 79, 20; part of sea wall repaired and raised, 83, 28; 84, 33.

Fort Du Pont:

Dike along river front nearly completed, 73, 14. Completed, 74, 17. Top entirely swept away by severe storm, rendering further repairs useless. 78, 17.

Red Bank, N. J.:

Meadow banks breached by storm, 96, 488. Dike rebuilt under contract at cost of \$2,500. 97, 639.

Sites.

Measures taken to acquire site at New Fort opposite Fort Delaware (Fort Du Pont), 71, 17; 72, 14. Jurisdiction of United States to site at Finns Point perfected, 72, 13. Site for defenses at Red Bank, Gloucester county, N. J., acquired, and act giving consent of State of New Jersey to purchase of land approved, 73,

DELAWARE RIVER—Continued.

13. Part of Fort Mifflin reservation assigned to Navy Department, and another portion leased to Mrs. M. M. Black, 96, 487. Reservation at Red Bank, N. J., leased, 96, 488.

Submarine mines.

1875. Construction of torpedo casemate begun at Fort Mifflin, 75, 18.

1876. Fort Mifflin casemate completed, 76, 18. Torpedo casemate and cable gallery constructed at Fort Du Pont, 76, 18.

1885. Torpedoes at Fort Delaware painted and stored, 85, 27.

1887. Board of Engineers submitted estimates for 2 mining casemates for Philadelphia, 87, 11.

1891. Project prepared and approved for 1 casemate for Philadelphia, 91, 6.

1892. Allotments made for 2 casemates in 1891; work to be completed in 1892, 92, 8.

1893. One casemate completed at cost of \$37,760, and 1 modified at cost of \$27,765, 93, 8.

1895. All casemates required completed, 95, 9.

1897. \$1,600 allotted for construction of cable tank; work completed; tank has overhead traveling crane, 97, 637.

\$7,200 allotted for construction of fire-proof torpedo storehouse of brick; plans approved and material ordered, 97, 638.

1898. Storehouse completed at cost of \$5,588; building described, 98, 649. Casemates and loading room fitted up, dynamite and cables purchased, and everything gotten ready to plant mines upon outbreak of war. Order received Apr. 22; 3 grand groups planted by May 13; planting of mines and apparatus used described; telephones installed; tests made and searchlight installed; condition of mines stated; guard tugs employed, 98, 655.

1899. Total allotment, \$22,200; mines became detached; mines raised and stored; several found to have been injured; 3 blown up; steel mooring ropes broken; condition of mines described; new cable received; reels too large; all parts of torpedo system put in good condition; cost of various operations stated; material cleaned and painted, 99, 802.

1900. Set of cable-testing instruments purchased, 1900, 856. \$200 allotted for care and preservation of material; searchlights overhauled and stored; inspection of torpedo material made, 1900, 865.

DETROIT RIVER. (See *Lake Ports*.)**Contracts.**

1882. Pointing the northwest front, and one face of the north bastion, \$1,240, 82, 9.

1883. Clearing and pointing scarp walls, \$1.15 per s. y.; clearing and pointing casemate walls, \$1.50 per s. y.; cutting out and replacing damaged brick, \$40 per m., 83, 5.

Forts and Batteries.—Operations.*Fort Wayne, Mich.*

1841. Work begun, 80, 18.

1862. New work begun, 83, 5.

1866. Work continued on scarp wall, flanking casemates, breast-height wall, and parapet, 66, 2.

1867. Work on breast-height wall; doors of casemates and magazines hung; road from dock to the country road finished; drainage begun; gun platforms completed; and sodding and embanking of parapet nearly completed, 67, 3.

1868. Widening of ditch to 25 f.; glacis graded; lateral batteries laid out; magazines of west battery completed; doors of west and east battery made; ramp leading from roadway up the glacis to the ditch opposite the sally port finished; new main roadway graded; and drains rebuilt, 68, 6.

1869. Widening of ditch completed; glacis completed on northwest front and east face of the north bastion; open ditch, for drainage, constructed and sodded, at foot of the glacis; parade ground leveled; and a fence to inclose the glacis begun, 69, 7.

1870. Glacis on the northwest, southeast, and water fronts completed and seeded; drain and fence along its foot built; iron work painted and slopes mowed. Batteries not yet completed, 70, 11.

1871. Plans for modifying work prepared; care and preservation, 71, 6.

1872. Care and preservation, 72, 3.

1873. Paving and sewerage done in rear of barracks, 73, 4.

1874. Perishable equipment and material sold at auction, 74, 6.

1875. Fences partly rebuilt, and boundary lines regraded, 75, 5.

1876. Rebuilding of fences and regrading grounds completed, 76, 6.

1880. Magazine floor rebuilt, 80, 18.

1882. Repairing begun; brick coping at the salient and shoulder angles replaced with cut stones; sally port repaired;

DETROIT RIVER—Continued.

masonry of cess-pools relaid; 6 casemate pent-houses rebuilt; new roof built over magazine; and scarp wall repaired and pointed, **82**, 9.

1883. \$10,000 allotted for completion of work. Scarp wall repaired. **83**, 5.

1884. Repair work completed in 1883, **84**, 10.

1885. Renewal of the demilune magazine roof and of the parade revetment on the southwestern front, **85**, 5.

1886. Gun platforms and demilune magazines repaired, **86**, 6. Table showing proposed armament, 1886. **86**, 509.

1899-1900. \$150 allotted for preservation, **99**, 974; **1900**, 973.

DUMPLINGS BATTERY, CANANICUT ISLAND, R. I. (See *South-east coast of Massachusetts and Rhode Island.*)

DU PONT. (See *Delaware River.*)

DUTCH ISLAND, R. I., NARRAGANSETT BAY. (See *Massachusetts and Rhode Island.*)

FERNANDINA, FLA., TEMPORARY BATTERIES. (See *Georgia and Cumberland Sound.*)

FINNS POINT, N. J. (Battery at). (See *Delaware River.*)

ENGINEER DEPOT. (See *Post at Fort Totten.*)

ENGINEERS, BATTALION OF. (See *Post at Fort Totten.*)

ENGINEER SCHOOL. (See *Post at Fort Totten.*)

FLORIDA, EAST COAST, AND KEY WEST.

Contracts.

1897. Emplacements for 4 10-inch guns, 2 8-inch guns, and 8 12-inch mortars, \$378,992, **97**, 13.

1898. Portland cement, \$2.70 per barrel. Rosendale cement, \$1.35 per barrel. Silica sand, \$1.66 per c. y. Coral sand, 70 cents per c. y. Broken brick (including crushing and hauling), \$1.93½ per c. y. **99**, 894.

Engineering features.

Brick, broken, for concrete, **99**, 892, 894.

Cement, tests of Rosendale, **97**, 706.

Concrete made with broken brick in place of broken stone, **99**, 892, 894.

Cracks in battery, methods of filling, **99**, 897.

Crane, description of traveling, **99**, 892.

Emplacements, itemized cost of 4 10-inch, 2 8-inch, and 8 12-inch mortars, **97**, 713.

Plant, construction, description of, **97**, 704.

Waterproofing methods, **99**, 897.

Engineers.

CHIEF OF ENGINEERS. **66**, 15; **67**, 13; **68**, 17; **69**, 16; **70**, 24; **71**, 20; **72**, 18; **73**, 19; **74**, 23; **75**, 23; **76**, 24; **77**, 20; **78**, 23; **79**, 27; **80**, 45; **81**, 45; **82**, 43;

83, 39; **84**, 45; **85**, 38; **86**, 38; **91**, 11, 533; **92**, 15, 471; **96**, 18; **97**, 17, 702; **98**, 26, 716; **99**, 27, 888; **1900**, 25, 923.

BOARDS OF ENGINEERS:

1882. Constituted to consider and report upon the condition of fortifications, and what number if any could be dispensed with, **82**, 423.

ENGINEERS IN CHARGE:

Maj. W. McFarland, 1866-68.

Col. J. H. Simpson, 1868-69.

Lt.-Col. C. E. Blunt, 1869-74.

Lt. J. B. Quinn, 1870.

Col. Q. A. Gillmore, 1871-84.

Maj. J. A. Smith, 1874-77.

Capt. W. H. Heuer, 1877-84.

Capt. J. C. Post, 1883.

Capt. T. Turtle, 1884-85.

Capt. W. T. Rossell, 1885-86.

Capt. W. M. Black, 1886-92.

Maj. J. C. Mallery, 1892.

Maj. T. H. Handbury, 1896.

Lt. Col. W. H. H. Benyaurd, 1896-99.

Capt. C. H. McKinstry, 1898-1900.

Capt. T. H. Rees, 1900.

ASSISTANTS:

Lt. D. D. B. Gaillard, 1891-92.

Lt. J. J. Meyler, 1896-97.

Lt. R. P. Johnson, 1897-99.

Capt. W. W. Harts, 1898-99.

Lt. E. M. Markham, 1899-1900.

FLORIDA, EAST COAST, AND KEY WEST—Continued.**Forts and batteries.^a—Operations.***East coast of Florida.—Fort Marion.*

1756. Fort essentially completed. First named Fort San Augustine; later, Fort San Marcos; built by the Spaniards. Its construction extended through a period of more than 100 years. **77, 20.**

1873. Repair of bridges and arch of a large vault, **73, 19.**

1875. Fort repaired and certain Indian prisoners or hostages placed in it, **75, 23.**

1876. Repair of fort continued, **76, 24.**

1877. History of fort; built of coquina—a natural shell-concrete found in the vicinity, **77, 20.**

1878. Modification project still under consideration, **78, 23.**

1883. Repairs made so that French officers could occupy the fort for the purpose of observing the transit of Venus, **83, 40.**

1884. \$5,000 appropriated, **84, 45.**

1885. Picket fence built around reservation, **85, 38.**

1886. Repair of sea wall and breast-height wall; bastion towers renewed, interior wall refaced, ramp rebuilt; minor repairs, **86, 38.**

1891. \$15,000 appropriated. 342.5 f. of sea wall built, terreplein paved and drained, communications restored and renewed, ditch cleaned and graded, glacis planes restored; minor work. **91, 11, 533.**

1892. Entire terreplein coated with paraffin and petroleum, 260 f. of covered drain laid, pavement leveled, and trees planted, **92, 15.**

1899. \$200 allotted for minor repairs. Fort converted into a military prison in July, 1898. Some repairs made by the Quartermaster's Department. **99, 888.**

1900. Shrubby cut down and removed and repair of masonry work of the "city gates," **1900, 923.**

Key West, Fla.—Fort Taylor and batteries.

1844. Main work begun, **80, 45.**

1866. Repair of work damaged by

hurricane of Oct. 22, 1865. Wrecks removed, breakwaters rebuilt and adjusted, 2 new ones built, sea wall repaired, etc.; flagging laid in most of the casemates of the advanced batteries of towers 1 and 2; minor work. **66, 15.**

1867. Work on sea walls, glacis of tower 1; minor work, **67, 13.**

1868. South end of covered face filled in with sand. Work on sea wall, ditch, and embankment. **68, 17.**

1870. Modification plans being prepared. Pintles placed on barbette pier. **70, 24.**

1871. Modification plans approved—improvement of main work, completion of the advanced towers, construction of 2 exterior barbette batteries for heavy guns with magazine traverses. Necessary repair of buildings. **71, 21.**

1872. \$42,500 appropriated. Modification work begun, scarp wall of 4 magazines strengthened, barbette pier modified by removal of 18 platforms for 10-inch guns, and placing 2 15-inch gun platforms and 3 sand traverses; work on embankments; casemate foundations for platforms and the platforms themselves laid; minor work. **72, 18.**

1873. \$50,000 appropriated. South end of north battery completed, and 2 15-inch guns mounted. Work on salient and adjoining faces. Breast-height wall for 4 guns built, and minor work. Summary of work. **73, 20.**

1874. \$20,000 appropriated. Work on sea walls. Sand embankment and parapet; minor work. **74, 23.**

1875. \$15,000 appropriated. 587 c. y. masonry sea wall built, and 11,574 c. y. sand embanked in south battery. 6 large masonry shot beds built in rear of casemate. Buildings repaired, and minor work. **75, 23.**

1876. Sea wall repaired, and minor repairs of the works damaged by hurricane of 1875. Summary of work. **76, 24.**

1877. General repairs, care and preservation, **77, 20; 78, 23; 79, 27; 80, 45.**

1881. Bridge 720 f. long, connecting

^a List of works as arranged under this head—

East coast of Florida.—Fort Marion.

Key West, Fla.—Fort Taylor and batteries.

Dry Tortugas, Fla.—Fort Jefferson, Garden Key.

New Fort at Tortugas, Fla.

Key West, Fla.—Emplacements for two 12-inch B. L. rifles on barbette carriages.

St. Francis Barracks.

Key West, Fla.—Emplacements for four 10-inch guns on disappearing carriages, model 1896; two 8-inch guns on disappearing carriages, model 1894, and eight 12-inch rifled mortars.

St. Johns River, Fla.—Temporary battery.

Miami, Fla.—Temporary battery.

St. Augustine, Fla.—Temporary battery.

St. Johns River, Fla.—Emplacements for two 8-inch B. L. rifles on strengthened 15-inch barbette carriages.

Key West, Fla.—Emplacements for two 4.7 R. F. guns.

Key West, Fla.—Four emplacements for 15-pounder R. F. guns.

Key West, Fla.—Two emplacements for 15-pounder R. F. guns.

FLORIDA, EAST COAST, AND KEY WEST—Continued.

the islands of Key West with the fort, completed, and care and preservation, 81, 45.

1865. Cisterns, drains, and buildings cleaned and repaired; minor work, 85, 38.

1886. 5 brick ventilators built, cisterns and buildings repaired, 3 bridges built over road crossings; minor work, 86, 39.

Dry Tortugas, Fla., Fort Jefferson, Garden Key.

1846. Work begun, 80, 46.

1866. Quarters repaired, walls of large detached magazine raised 13½ f. and of small magazine 7½ f.; 80,000 c. f. of sand removed from ditch and embanked; minor work, 66, 15.

1867. Quarters nearly completed; 16 barbette platforms received with the new pattern pintle, 67, 13.

1868. Quarters, except roofing with galvanized iron, completed; ditch on face 3 excavated, 68, 17.

1869. Work on officers' quarters and soldiers' barracks; excavating sand in ditch; minor work, 69, 17.

1870. Modified plans being prepared; work on quarters; 20 4-inch pintles set on barbette pier and all heavy modern guns on hand, with barbette carriages, mounted, 70, 24.

1871. \$42,500 appropriated, 71, 21.

1872. \$42,500 appropriated; work on sea wall and ditch; modified plans approved and work begun; 4 curtain magazines strengthened; 8 barbette magazines modified; 6 15-inch gun platforms begun and completed and 3 center-pintle masonry platforms for 300-pounder Parrott guns built, 72, 19. \$50,000 appropriated; sea wall around fort completed, circulation of ditch fully restored; masonry modification of barbette traverses finished, and balconies in their rear made serviceable; 6 15-inch guns and 3 300-pounder Parrott guns mounted, 72, 20.

1873. Repairs of works damaged by hurricane in October; work on embankment and quarters, 73, 24.

1875. 4-inch pintles placed in 8 platforms; care and preservation, 75, 24.

1876-84. Care and preservation, 76, 25; 77, 20; 78, 23; 79, 27; 80, 46; 81, 46; 83, 41; 84, 45.

1885. Repair of sewers and quarters, 85, 39.

1886. Building walks, painting casemates, buildings, etc., 86, 39.

New fort at Tortugas, Fla.

1866. Plans to be considered by the Board of Engineers, 66, 15.

1867. Best combination of materials for uncovered scarps not decided, 67, 13; 68, 17.

1869. Commencement to be deferred till a suitable project for the position be prepared, 69, 17.

Key West, Fla.—Emplacements for two 12-inch B. L. rifles on barbette carriages.

1898. \$40,000 allotted. Removing part of old fort. 98, 724.

1899. \$93,000 allotted. 9,166 c. y. of concrete composed of broken brick instead of broken stone and a number of 30-pounder, 100-pounder, and 300-pounder Parrotts, 8-inch columbiads, and 10-inch Rodmans (part of armament of old fort) embedded in the concrete to serve the same purposes as pieces of random stone. 2 guns and carriages received and base rings set. 99, 892.

1900. Trolley beams placed, doors hung, and battery turned over to the care of troops on February 3, 1900. Guns and carriages on hand, to be mounted by the troops. 1900, 926.

St. Francis Barracks.

1897. \$365 allotted for placing platform of 1 8-inch converted rifle, mounted for target practice; work completed, 97, 702.

1898. 8-inch rifle dismounted and moved to a temporary battery, 98, 716.

Key West, Fla.—Emplacements for four 10-inch guns on disappearing carriages, model 1896; two 8-inch guns on disappearing carriages, model 1894, and eight 12-inch rifled mortars.

1897. \$412,225 allotted. Work begun, under contract, on excavation. Description of plant. 97, 703.

1898. \$6,000 allotted. Concrete work completed, ironwork nearly completed (itemized quantity of work to date). \$9,300 allotted for moving and mounting guns and carriages. Three 10-inch and 2 8-inch guns and carriages and 6 mortar carriages mounted. 98, 721, 722.

1899. \$4,000 allotted for work on emplacement, and \$900 allotted for moving and mounting guns and carriages. One 10-inch gun and carriage, 2 mortar carriages, and 8 mortars mounted, completing the mounting of armament. Some concrete work, ironwork, and sand filling to be done. Items of work accepted and paid for to Jan. 30, 1899. 99, 891, 896.

1900. Ironwork completed. Some concrete work and sand filling to be done. Electrical firing apparatus installed in mortar battery. \$575 allotted for purchase and installing 12 locking devices for

FLORIDA, EAST COAST, AND KEY WEST—Continued.

ammunition hoists. Work done by hired labor. \$1,800 allotted for providing communicating galleries between emplacements. Plans prepared. Work delayed because of yellow fever. 1900, 925.

St. Johns River, Fla.—Temporary battery.

1898. \$13,160 allotted. Consent of owners of land obtained; work begun in April on a temporary battery to mount 5-inch B. L. siege rifles and 7-inch B. L. siege howitzers; built of 10 by 10-inch timber in revetment, and magazine walls with sand embankment. Two magazines in traverses provided. Gun and howitzers received and mounted in May. 98, 716.

1899. \$100 allotted; work completed, 99, 888.

Miami, Fla.—Temporary battery.

1898. \$12,460 allotted. Consent obtained from owners of the land; work begun Apr. 13, and by May 12, the battery was practically completed, 98, 717.

1899. \$470 allotted; armament and all other property removed and the battery abandoned, 99, 890.

St. Augustine, Fla.—Temporary battery.

1898. \$12,460 allotted. Project approved for timber revetment walls and sand embankment, with 2 magazines in traverses, also built of timber and covered with sand. 98, 717.

1899. Battery completed and turned over to troops, 99, 888.

St. Johns River.—Emplacements for two 8-inch B. L. rifles on strengthened 15-inch barbette carriages.

1898. \$29,000 allotted. Consent obtained from owners of the land. Work begun, excavation completed, and foundations for the platforms prepared. 98, 718.

1899. \$3,500 allotted. Concrete work begun, platforms completed, carriage altered, and guns mounted. 99, 889.

Key West, Fla.—Emplacements for two 4.7 R. F. guns.

1898. \$10,000 allotted. Two temporary platforms built and guns mounted. Work begun on permanent emplacements. 98, 724.

1899. \$8,000 allotted. Work on permanent emplacements begun. 1,415 c. y. concrete, composed of broken brick instead of broken stone, and 3,478 c. y. sand placed. Emplacement completed. Itemized cost of work. 99, 894.

1900. Emplacements turned over to troops, 1900, 926.

Key West, Fla.—Four emplacements for 15-pounder R. F. guns.

1899. \$22,000 allotted. 2 emplacements completed awaiting arrival of gun carriages. 850 c. y. of concrete, composed of broken brick instead of broken stone, and 2,050 c. y. sand placed. On the other 2 emplacements work was delayed somewhat, only 506 c. y. concrete, similar to that above, placed. 99, 894.

1900. \$750 allotted. 627 c. y. of concrete placed. No further work can be done until receipt of the gun mounts. 1900, 926.

Key West, Fla.—Two emplacements for 15-pounder R. F. guns.

1900. \$13,000 allotted; plans approved; no work, 1900, 927.

Miscellaneous.

Electric light plant.—Key West, Fla.

1899. \$18,500 allotted. Work begun on 2 power stations and 2 separate light plants; stations completed, one dynamo installed, and wiring in progress. 99, 895.

1900. \$800 allotted. Work completed and turned over to the care of troops on March 12, 1900. 1900, 927.

Preservation and repair.

1897. Key West—\$3,701.12 allotted, repair of quarters and bridges, 97, 707.

1898. Key West—\$5,950 allotted, repair of bridges, buildings, and 2 temporary platforms for 15-inch guns built of timber and concrete; no guns mounted. 2 unserviceable platforms torn out and guns, still mounted on carriages, moved to the rear. 3 platforms of concrete and granite pintle blocks, for 8-inch converted rifles, built on site of the old platforms, and guns mounted. 98, 724.

1899. Fort Marion, Fla.—\$200 allotted for minor repairs, 99, 888. St. Johns River—\$2,350 allotted for care of torpedo material, railroad track, and care of property, 99, 889. \$875 allotted for repair of leaks in gun and mortar batteries; methods and results of waterproofing, 99, 896. \$3,000 allotted for a roadway. Work on sand fill. 99, 897. \$700 allotted for repairs to bridges and buildings. \$400 allotted for storage of torpedo material; work completed. 99, 897.

1900. St. Johns River—\$1,700 allotted for cleaning and storing torpedo material and for watchman's services, 1900, 923. Roadway—1,000 c. y. of brick crushed and 250 blocks of concrete curbing, each 4 f. long, made; necessary fill incomplete. 1900, 927. \$100 allotted for supplies for care and preservation of electric-light plant; supplies purchased and

FLORIDA, EAST COAST, AND KEY WEST—Continued.

turned over to the care of troops, 1900, 929.

Range and position finders.

1899. Key West—\$20 allotted. 5-inch cast-iron pipes filled with cement were set up as stations for Lewis depression range finders, emergency (B) type. Base rings for the instruments set in mortar on top of these pipes. 99, 896.

Sites.

Key West:

\$1,600 allotted and one site, Livermore estate, bought. \$100 allotted for incidental expenses connected with acquirement of another site for which condemnation proceedings were instituted. 97, 707. \$19,800 allotted and site, for which proceeding had been instituted, purchased. 98, 723.

East coast of Florida:

\$250 allotted for survey of site needed for fortification purposes, 99, 890. \$1,500 allotted for making a topographical survey; completed. 1900, 924.

Submarine mines.

1897. Key West, Fla.—\$10,000 allotted for mining casemate and cable gallery. Project. Work begun and the cable gallery completed. Tables showing results of Rosendale cement tests. 97, 705.

1898. St. Johns River, Fla.—\$8,000 allotted for planting mines, material purchased, and mines made ready for planting, 98, 720. Key West—\$22,000 allotted for purchasing material and planting mines and operating a 30-inch searchlight. Mines planted, and searchlight operated nightly. 98, 725.

1899. St. Johns River, Fla.—Mines removed in Sept., 1898, by exploding them; cable and other material stored. 1,800 pounds of unused dynamite sold for \$216 to the dealer who furnished it. 99, 889. Key West—\$4,800 allotted for a cable tank, with railroad track leading to breakwater; work about completed. \$200 allotted for fitting up casemates for the storage of torpedo material; not completed. 99, 895. \$682 allotted for operating searchlights; as all mines were removed by explosion the money was not used. 99, 897.

1900. \$3,105 allotted for general repair of plant, painting ironwork, etc., and caring for torpedo material, 1900, 928.

Supplies for coast defenses.

1900. \$600 allotted for such supplies as might be called for by requisition of the artillery, duly approved by the Chief of Engineers, 1900, 929.

FOOTE. (See *Washington, D. C.*)

FORT GRATIOT MILITARY RESERVATION, MICH. (See *Lake ports.*)

Engineers.

CHIEF OF ENGINEERS. Reports, 71, 104; 72, 102; 73, 116.

Operations.

1871. By acts of July 20, 1868, and Mar. 18, 1870, this reservation was divided into lots of convenient size and 242 were sold. \$3,000 appropriated for defraying expenses. Amount received from sale of lots, \$41,524. Another sale contemplated. 71, 104.

1872. Another sale began Aug. 8,

1872, and continued till all lots offered were sold. Amount received was \$58,433.91; a small part unsold. \$2,000 appropriated for properly laying out the streets and lots. 72, 102.

1873. Act of Mar. 3, 1873, authorized the Secretary of War to survey, plat, and sell the cemetery grounds, subject to certain restrictions. No preliminary action, provided by the statute, had been taken by the city of Port Huron. 73, 116.

FORTS.

- Adams, Newport Harbor, R. I. (See *Massachusetts, southeast coast of, and Rhode Island at New Bedford, Mass., and Newport, R. I.*)
- Andrew. (See *Boston Harbor, Mass.*)
- Barrancas and Redoubt. (See *Pensacola, Fla.*)
- Canby, Wash. (See *Columbia River, Oreg. and Wash.*)
- Carroll. (See *Baltimore, Md.*)
- Caswell, Cape Fear River. (See *North Carolina.*)
- Clinch, Fla. (See *Georgia and Cumberland Sound.*)
- Columbus. (See *New York Harbor.*)
- Constitution. (See *Portsmouth Harbor, N. H.*)
- Delaware, Del. (See *Delaware River.*)
- Du Pont, Del. (See *Delaware River.*)
- Foot, Potomac River, Md. (See *Washington, D. C.*)
- Gaines, Dauphin Island. (See *Mobile and Mississippi Sound.*)
- Gorges, Me. (Hog Island Ledge, Me.) (See *Maine coast.*)
- Green, R. I. (See *Southeast coast of Massachusetts and Rhode Island.*)

FORTS—Continued.

Griswold, Groton, Conn., Battery at. (See *Long Island, Eastern entrance to Sound and coast of Connecticut.*)
Hale, Long Island Sound. (See *Eastern entrance to, and coast of Connecticut.*)
Hamilton, and additional batteries. (See *New York Harbor.*)
Independence (Castle Island). (See *Boston Harbor, Mass.*)
Jackson. (See *Georgia and Cumberland Sound.*)
Jackson, Mississippi River, La. (See *New Orleans, La., and Sabine Pass, Tex.*)
Jefferson, Garden City. (See *Florida, east coast, and Key West.*)
Johnson, James Island. (See *North Carolina; South Carolina.*)
Knox, Bucksport, Me. (See *Maine coast.*)
Livingstone, Barataria Bay, La. (See *New Orleans, La., and Sabine Pass, Tex.*)
Macomb, Chef Menteur Pass, La. (See *New Orleans, La., and Sabine Pass, Tex.*)
Macon, Beaufort Harbor. (See *North Carolina.*)
Marion. (See *Florida, east coast, and Key West.*)
Mason. (See *San Francisco, Cal.*)
McClary, Me. (See *Portsmouth Harbor, N. H.*)
McHenry. (See *Baltimore, Md.*)
McRee. (See *Pensacola, Fla.*)
Mifflin, Pa. (See *Delaware River.*)
Monroe, Old Point Comfort, Va. (See *Hampton Roads, Va.*)
Morgan, Mobile Point, Ala. (See *Mobile and Mississippi Sound.*)
Mott, N. J. (See *Delaware River.*)
Moultrie, Sullivan Island. (See *South Carolina coast.*)
Niagara, N. Y. (See *Lake ports.*)
Oglethorpe, Ga. (See *Georgia and Cumberland Sound.*)
Ontario, Oswego, N. Y. (See *Lake ports.*)
Phoenix. (See *Southeast coast of Massachusetts and Rhode Island.*)
Pickens. (See *Pensacola, Fla.*)
Pike, Rigolets Pass, La. (See *New Orleans, La., and Sabine Pass, Tex.*)
Point, Fort at. (See *San Francisco, Cal.*)
Popham, Me. (See *Maine coast.*)
Preble (New Fort). (See *Maine coast.*)
Pulaski, Cockspur Island. (See *Georgia and Cumberland Sound.*)
Schammel. (See *Maine coast.*)
Schuyler, East River. (See *New York Harbor.*)
Bewell. (See *Boston Harbor, Mass.*)
St. Philip, Mississippi River, La. (See *New Orleans, La., and Sabine Pass, Tex.*)
Standish. (See *Boston Harbor, Mass.*)
Stevens, Oreg. (See *Columbia River, Oreg. and Wash., mouth of.*)
Sumter. (See *South Carolina, coast of.*)
Taylor, and batteries. (See *Florida, east coast, and Key West.*)
Tompkins. (See *New York Harbor.*)
Totten. (See *Post at Fort Totten.*)
Trumbull, at "Fort Point." (See *Long Island Sound, eastern entrance to, and coast of Connecticut.*)
Wadsworth (formerly Fort Richmond). (See *New York Harbor.*)
Warren (Georges Island). (See *Boston Harbor, Mass.*)
Washington, Potomac River, Md. (See *Washington, D. C.*)
Winfield Scott. (See *San Francisco, Cal.*)
Winthrop, and batteries. (See *Boston Harbor, Mass.*)
Wood. (See *New York Harbor.*)
Wool, Va. (See *Hampton Roads, Va.*)

GAINES. (See *Mobile and Mississippi Sound.*)

GALVESTON, TEX.**Contracts.**

1896. Battery for 8 12-inch mortars, \$96,491.80, 97, 742.

1899. Electric light plant for 10-inch battery No. 1 and mortar battery No. 1, \$9,248, 99, 958.

Engineering features.

Carriages, releveling, 99, 953, 973.

Cement, table of tests, 96, 526; 97, 737, 741.

Concrete, cost per c. y., 98, 766; 1900, 970.

Concrete, ingredients of, 96, 525; 97, 737; 99, 959.

Condensation, methods of preventing. Report. 99, 951, 960, 970.

Drainage system, description of, 99, 951.

Grillage foundations of old railroad iron, 98, 768; 99, 955.

Mines, defects noticed in submarine, 98, 770.

Mines, description of, method of laying and removing, 98, 769, 99, 964.

Seepage through concrete roof, prevention of. Report. 99, 952, 970.

Engineers.

CHIEF OF ENGINEERS. Reports, 79, 31; 80, 51; 81, 52; 82, 50; 83, 46; 84, 52; 85, 45; 86, 45; 96, 19, 524; 97, 19, 737; 98, 29, 765; 99, 33, 951; 1900, 29, 958.

BOARD OF ENGINEERS:

1882. Constituted to consider and report upon the construction of fortifications, and what number, if any, could be dispensed with. Report, 82, 427.

ENGINEERS IN CHARGE:

Lt. Col. A. M. Miller, 1896-98.

Capt. C. S. Riché, 1898-1900.

Maj. J. B. Quinn, 1898-99.

ASSISTANTS:

Lt. W. V. Judson, 1896-97.

Capt. C. S. Riché, 1897-98.

GALVESTON, TEX.—Continued.

Lt. H. Burgess, 1898-99. Report, 98, 769.

Forts and batteries.—Operations.

Batteries at entrance to harbor.

1879-86. Plans made for batteries at Pelican Spit, Galveston Island, and Bolivar Point, 79, 31; 80, 51; 81, 52; 82, 50; 83, 46; 84, 52; 85, 45; 86, 45.

Emplacement for two 10-inch guns, Battery No. 1.

1897. \$100,000 allotted. Work begun on one emplacement designed for all-around fire and one for limited fire, and site raised to a level of 8 f. above m. l. t.; concrete work in progress. Summary of work with itemized cost. 97, 738.

1898. \$17,500 allotted. Concrete work and earth work completed. To protect the parapet from wave action during storms, sheet piling, protected on the outside by riprap, placed. Gun and carriage mounted in south emplacement; another gun on hand; settlement; carriage in south emplacement leveled up. Summary of work with itemized cost. 98, 765.

1899. All-around fire carriage received, mounted with gun, and tested; new drain system completed; waterproofing completed. Itemized cost of emplacement, 99, 951. \$2,500 allotted for concrete splinter-proof power house; work begun and completed, 99, 953.

1900. Electric plant installed, and the completed battery turned over to the artillery. Total cost, \$117,500. Power house completed; cost, \$2,500. 1900, 958.

Mortar battery, No. 1.

1897. \$117,700 allotted. Work begun under contract; sheet-piling revetment completed; site of battery raised; mortar platforms completed and made ready for iron work. Summary of work. 97, 740.

1898. Concrete work and sand fill completed; \$1,600 allotted. Carriages mounted and battery, except installing electric plant, completed. 98, 766.

1899. New drainage system completed; carriages leveled, and all work, except installing electric plant, completed. Itemized cost of work. 99, 953.

1900. Electric plant installed; completed battery transferred to the artillery, 1900, 959.

Two 4.7-inch R. F. emplacements.

1898. \$26,000 allotted. Work begun May 23, 1898. Sheet piling driven around site under contract; 2,000 c. y. sand and 725 t. riprap placed; work in progress. 98, 768.

1899. \$15,000 allotted. Emplacements completed and guns mounted. Itemized cost of work. 99, 961, 966.

1900. Completed emplacements transferred to the artillery Oct. 25, 1899, 1900, 966, 970.

Two 10-inch gun emplacements, Battery No. 2.

1898. \$100,000 allotted. Work begun. 954 piles driven for foundation; grillage of old r. r. rails running in both directions and embedded in the concrete, and 5,310 c. y. concrete placed. 98, 768.

1899. \$10,000 allotted. Concrete work completed, carriages mounted; guns not on hand. Description of waterproofing and ventilating systems. Itemized cost of work. 99, 959, 969.

1900. Guns and carriages received and mounted and battery completed, 1900, 965, 972.

Two 8-inch gun emplacements.

1898. \$100,000 allotted. Railroad track built to connect site of battery with Gulf & Interstate Rwy. 776 piles driven for foundation; grillage of two layers of old r. r. iron placed. 4,273 c. y. concrete placed. Platforms ready for base rings. 98, 769.

1899. \$10,000 allotted, and \$1,000 transferred from 10-inch emplacements; carriage and gun mounting in progress. Summary, and itemized cost of work. 99, 960, 967.

1900. Mounting of guns and carriages completed; waterproofing completed, and the completed battery transferred to the artillery, Oct. 25, 1899, 1900, 966, 971.

Two emplacements for 15-pounder R. F. guns, Battery No. 1.

1899. \$30,000 allotted for guns on pillar mounts; work begun, trestle built,

a List of works as arranged under this head—

Batteries at entrance to harbor.

Emplacement for two 10-inch guns, Battery No. 1.

Mortar Battery, No. 1.

Two 4.7-inch R. F. emplacements.

Two 10-inch gun emplacements, Battery No. 2.

Two 8-inch gun emplacements.

Two emplacements for 15-pounder R. F. guns, Battery No. 1.

Two emplacements for 15-pounder R. F. guns, Battery No. 2.

Three emplacements for 15-pounder R. F. guns.

Mortar Battery No. 2.

Emplacements for two 6-inch guns.

GALVESTON, TEX.—Continued.

and pipe laid for filling the site for battery. U. S. dredge boat altered. Itemized cost of work. 99, 955, 967.

1900. \$3,000 transferred from other works. Site filled in, concrete work completed, 741 c. y. placed; 660 c. y. riprap placed, and battery completed ready for guns. Itemized cost of work. 1900, 959, 969.

Two emplacements for 15-pounder R. F. guns, Battery No. 2.

1899. \$15,000 allotted. Work begun Jan. 9, foundation piles driven and a grillage of old r. r. iron laid; concrete work nearly completed, sheet piling revetment completed, emplacement ready for armament. Summary and itemized cost of work. 99, 955, 970.

1900. \$1,500 transferred to other works. Battery, except blast surfaces and part of riprap protection, completed. Sand fill completed, 3,433 c. y. placed. No guns received. 1900, 960, 972.

Three emplacements for 15-pounder R. F. guns.

1899. \$30,000 allotted. Work begun January 26; all sheet piling driven, foundation piles driven, grillage of old railroad iron placed, and gun platforms made ready for carriages. Summary of work. 99, 956, 968.

1900. \$1,500 transferred to other works. Concrete work completed, 1,109 c. y. placed; sand protection completed, 4,000 c. y. placed. Battery completed and turned over to the artillery March 31. No guns or carriages received. Itemized cost of work. 1900, 961, 971.

Mortar battery.—No. 2.

1899. \$125,000 allotted. Work begun September 17, 1898, foundation piles driven, timber grillage laid, concrete work nearly completed; damp course at the 9-foot elevation under all magazines, and an asphalt course over all roofs, completed. Summary and itemized cost of work. 99, 957, 969.

1900. Sand fill completed, 50,245 c. y. placed, 920 t. riprap protection placed, 8 mortars and carriages received. Itemized list of expenditures. 1900, 963, 972.

Emplacements for two 6-inch guns.

1900. \$5,000 allotted. Work begun; 125,000 c. y. sand filling placed on site; sand fences built to prevent cutting of channel through the site during high tide. 1900, 965, 971.

Miscellaneous.

Electric-light plant.

1899. \$10,000 allotted for 10-inch battery No. 1 and 12-inch mortar battery No. 1. Work done under contract, wiring completed, dynamos and engine installed, work in progress. 99, 957.

1900. Installation completed and battery transferred to the artillery, 1900, 963, 971.

Preservation and repair.

1899. \$7,100 allotted. Drainage system and waterproofing completed at 10-inch battery No. 1, and slopes repaired at mortar battery No. 1, 99, 958.

1900. \$2,455 allotted. Repairing ammunition hoists, slopes; planting Bermuda grass seed on slopes; planting trees; releveling gun platforms; repairing magazine doors; minor work, 1900, 964.

Sites.

\$71,000 allotted for one site, 97, 741.

\$4.75 allotted for a second site, 98, 767.

Submarine mines.

1896. \$10,000 allotted. Work begun on a mining casemate, 111 c. y. concrete placed. Ingredients of concrete. Testing cement. 96, 19, 524.

1897. \$9,562.40 allotted. Work completed; a total of 1,085 c. y. concrete and 10,795 c. y. of earth placed. Total cost, \$15,009.27. Itemized cost of work. 97, 737.

1898. \$12,000 allotted. Supplies purchased and a temporary line of torpedo defense begun, but discontinued after reception of other material; mines planted and tests made. 98, 769.

1899. \$750 allotted. Searchlight installed on 2 railway flat cars, on the U. S. jetty track, 99, 963. \$3,000 allotted for cable tank; work begun and nearly completed; cable stored, 99, 963. \$2,000 allotted for a wooden torpedo storehouse. Work begun and completed, except minor work; torpedoes, anchors, and other submarine mining material stored, 99, 963. Report on planting and removing mines, 99, 964.

1900. Cable tank completed and cable stored, 1900, 967. Torpedo storehouse completed and all torpedo material stored, 1900, 968. \$5,000 allotted for system of tracks for submarine-mining service; work completed. Itemized cost, 1900, 968, 971.

GEORGETOWN, S. C. (Batteries). (See *South Carolina, coast of.*)

GEORGIA AND CUMBERLAND SOUND.

Contracts.

1896. Wharf, \$15,361.72. Emplacements for four 8-inch guns, \$126,861. 97, 701, 702.

1899. Portland cement, 5,000 barrels, \$2.47 per barrel, 1900, 919.

Engineering features.

Cement testing, 1900, 918.

Concrete mixing, 99, 872.

Cracks, repairs of, 99, 870.

Guns, moving and mounting, 99, 877.

Magazines, dampness in, 99, 884.

Materials, construction, itemized cost, 98, 709; 99, 873; 1900, 917.

Plant, arrangement of, 99, 870.

Portland cement specifications, 1900, 918.

Settlement of emplacements, 99, 870.

Teredo, protection of piles against, 97, 700.

Vegetable growth for holding sand, 99, 879.

Waterproofing, 99, 871; 1900, 918, 920.

Wharf, description and cost, 97, 700.

Engineers.

CHIEF OF ENGINEERS. 66, 14; 67, 12; 68, 16; 69, 16; 70, 23; 71, 20; 72, 17; 73, 18; 74, 22; 75, 22; 76, 23; 77, 19; 78, 22; 79, 26; 80, 44; 81, 44; 82, 41; 83, 47; 84, 42; 85, 36; 86, 36; 94, 10; 95, 11; 96, 17, 517; 97, 17, 700; 98, 25, 707; 99, 27, 870; 1900, 25, 917.

BOARD OF ENGINEERS:

1882. Constituted to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with, 82, 423.

ENGINEERS IN CHARGE:

Maj. F. A. Sears, 1866.

Capt. J. W. Barlow, 1866-70.

Col. Q. A. Gillmore, 1869-86.

Capt. W. Ludlow, 1870.

Capt. J. C. Post, 1883.

Capt. O. M. Carter, 1894-98.

Capt. C. E. Gillette, 1898-1900. Report, 99, 884.

Lt. Col. W. H. H. Benyaard, 1899.

Capt. C. H. McKinstry, 1899-1900.

ASSISTANTS:

Lt. H. Burgess, 1896.

Lt. H. S. Morgan, 1898-99.

Lt. C. S. Brownwell, 1898-99.

Lt. Lytle Brown, 1899-1900.

Lt. E. M. Markham, 1900.

Forts and batteries. a—Operations.

Savannah.—Fort Pulaski, Cockspur Island, mouth of Savannah River, Ga.

1829. Work begun, 80, 44.

1869. Work begun preparing to mount armament—brick and stone masonry work, repair of gun platforms, taking up and resetting traverse stones and rails to restore the proper radius and level; thorough repair of the water battery, and construction of 6 wooden platforms for 100-pounder rifles, 69, 16.

1870. Estimated cost of approved modifications, \$53,000; necessary repair of gun platforms to enable guns on hand to be mounted; wooden wharf built, 70, 24.

1871. \$26,500 appropriated, 71, 20.

1872. \$25,000 appropriated. Necessary temporary buildings erected; old gun platforms and breast-height wall of the demilune removed; scarp wall of both faces raised; exterior and superior slopes rearranged and sodded; old terreplein excavated for piling and grillage for the guns and magazines of the north face; construction of the grillage for 2 guns in the northeast angle; driving of piling for the adjacent service magazine; replacing the drawbridge over the demilune ditch, and minor work. 72, 17.

1873. \$50,000 appropriated. Completion of sand filling over grillage; retaining wall in rear of gun platforms and the breast-height wall for 2 gun platforms; scarp wall of the gorge face raised; new pile driver built; grillage laid for the

a List of works as arranged under this head—

Savannah—Fort Pulaski, Cockspur Island, mouth of Savannah River, Ga.

Savannah—Fort Jackson, Savannah River, Ga.

Savannah—Fort Oglethorpe, Savannah River, Ga.

Cumberland Sound—Fort Clinch, Amelia Island, Fla.

Savannah—New fort on Tybee Island, mouth of Savannah River, Ga.

Savannah—Four emplacements for 8-inch rifles, disappearing carriages.

Savannah Harbor, Ga.—Emplacement for 12-inch B. L. rifles, nondisappearing carriages.

Savannah, Ga.—Emplacement for 6-inch R. F. gun.

Savannah, Ga.—Platform for 8-inch rifle.

Savannah, Ga.—Rapid-fire emplacement.

Savannah, Ga.—Rapid-fire emplacement at Wassaw Sound.

Brunswick, Ga.—Temporary defenses.

Darien, Ga.—Temporary defenses.

Cumberland Sound—Emplacement for 8-inch B. L. rifle.

Cumberland Sound—Temporary batteries.

Fernandina, Fla.—Temporary batteries.

Savannah, Ga.—Emplacements for eight 12-inch mortars.

Savannah, Ga.—Emplacements for two 4.7-inch R. F. guns.

Savannah, Ga.—Site 1.—Emplacements for two 15-pounder R. F. guns.

Savannah, Ga.—Site 2.—Emplacements for two 15-pounder R. F. guns.

GEORGIA AND CUMBERLAND SOUND—Continued.

adjacent service magazine to guns 8 and 9, north face; piling for foundation of gun platforms 6 and 7 completed, and minor work. 73, 18.

1874. \$20,000 appropriated. Completion of breast-height wall and concrete foundations of gun platforms 8 and 9; masonry of service magazine and passage-way between guns 7 and 8, and work on platforms 4, 5, 6, and 7; 2 guns of approved caliber mounted on 8 and 9, and minor work. Summary of work. 74, 23.

1875. Parapet on north and south faces of demilune nearly completed; all gun platforms laid; work on parados. All doors made and hung, and minor work. Summary of work. 75, 23.

1876. Entire demilune nearly completed; retaining wall rebuilt; modification work begun. New piers on north front raised. 76, 23.

1877. Preservation and care, 77, 19; 78, 22; 79, 26.

1882. Repairs to buildings and bridges, 82, 41.

1883. Wooden fronts of casemates renewed; repairs to wharf, 83, 38.

1884. Concrete masonry covered with sand up to grade, and slopes sodded; dikes repaired, 84, 44.

1885. Buildings repaired; contract made for repairing 20 permanent platforms for 8-inch and 10-inch Rodman guns on the barbette of the main work, 84, 36.

1886. 20 platforms repaired; general repair of work, 86, 36.

Savannah, Fort Jackson, Savannah River, Ga.

1842. Work begun, 80, 44.

1870. Estimated cost of approved modifications, \$16,000, 70, 23.

1872. \$15,000 appropriated, 72, 17.

1873. Modification work begun. Casemate arches reinforced, scarp wall raised and breast-height wall completed; parade wall partly rebuilt and raised; 2 earthen traverses removed from terreplein and the material used to fill in the parapet. 73, 18.

1874. Parade and breast-height wall finished, parade wall raised, and concrete foundations for guns 1, 2, 4, and 5 built and gun platforms laid. Temporary armament of 5 guns mounted; 10-inch S. B. in positions 1, 2, and 3, and 100-pounder Parrott rifles in positions 4 and 5. 74, 22.

1876. Service traverse magazine built between guns 3 and 4 of barbette battery. 76, 23.

1882. Repairs to bridges and doors, 82, 41.

1883. Wharf repaired and grass cut, 83, 37.

Savannah, Ga., Fort Oglethorpe, Savannah River, Ga.

1842. Work begun, 80, 44.

1870. Modification work begun, 80, 44.

1884. 2 casemates fitted up as storage rooms for engineer property and grass on slopes cut, 84, 43.

1885-86. Repairs to bridge and buildings, 85, 36; 86, 36.

Cumberland Sound—Fort Clinch, Amelia Island, Fla.

1847. Work begun, 80, 44.

1866. Curtain galleries connecting the parade with the terreplein of the chemin-de-ronde constructed, excavation for them filled in, and the ramparts made ready to receive the barbette gun platforms. Work on exterior parados wall, and filling of the glacis. 66, 14.

1867. 4 platforms, northeast and northwest curtains, completed; 4 other platforms on the northeast and 6 on the northwest nearly completed; foundations of breast height wall on 3 fronts laid, terreplein formed, graded and seeded; work on exterior wall of parados, drainage, quarters, and minor work, 67, 12.

1868. Main sewer completed, draw-bridge gateway nearly finished, completion of masonry of those gun platforms which had been begun. Work suspended; place in charge of a keeper. 68, 16.

1869. Preservation and care, 69, 16.

1870. Modification plans, estimated cost, \$106,000, 70, 24.

1871-72. Preservation and care, 71, 20; 72, 18.

1877. Barracks repaired, 77, 20.

1879. Modification plans necessary for the reception of proposed armament of modern guns, and for a new exterior battery, completed, 79, 27.

1880. Jetties to be built under contract, 80, 45.

1881. Work on jetties and on roofing over the 5-tower bastions; repair of quarters, 81, 45.

1882. 5 jetties completed, and minor work, 82, 42.

1883. Jetties extended, and 2 new spur jetties built, 83, 39.

1884. Breakwater or protection of wood to preserve the engineer officers' quarters at Old Fernandina built, and repairs made to buildings, 84, 44.

1885. Repairs made to 4 permanent front pintle platforms for 15-inch Rodman guns, and to 18 permanent front pintle platforms for 8-inch or 10-inch Rodman guns, or corresponding rifles; doorways leading to bastions repaired; and beach protected with compressed brush mattress work loaded with stone, 85, 37.

GEORGIA AND CUMBERLAND SOUND—Continued.

1886. General repair of buildings, etc., 86, 37.

1898. \$1,200 allotted. Temporary parapet of sand bags constructed in front of two 15-inch Rodman guns. Ammunition received, 30 shells shipped away. 98, 713.

Savannah, Ga.—New fort on Tybee Island, mouth of Savannah River, Ga.

1872. Plans in progress, 72, 18; 73, 19.

1874. Surveys made, 74, 23.

1875. Necessary land acquired, and its boundary marked with stone monuments, 75, 23.

1876. Plans completed, 76, 24.

1882. 3 jetties built, 590 f., 750 f., and 650 f. long, 82, 42.

1883. \$5,000 allotted from appropriations for preservation and repair of fortifications for increasing height of jetties, 83, 38.

1884. Some work done on jetties, 84, 44.

1885. Additional work on jetties to be done under contract, 85, 37.

1886. Jetties extended, 86, 37.

Savannah, Ga.—Four emplacements for 8-inch rifles, disappearing carriages.

1897. \$155,000 allotted. Work begun under contract, 2,864 c. y. excavated. Wharf completed under contract, description, 97, 700.

1898. \$23,950 allotted. 17,400 c. y. concrete placed, all work completed and 4 guns and carriages mounted. Summary of work, 98, 709.

1899. \$8,000 allotted. Slopes sodded, traverse circles extended and field of fire of each gun increased about 10 degrees; settlement repaired. 99, 870.

Savannah, Ga.—Emplacement for 12-inch B. L. rifles, nondisappearing carriages.

1898. \$40,000 allotted. Work begun, excavation for platforms completed; some concrete work. 4 telephone booths built. 98, 709.

1899. \$81,100 allotted. Excavation and concrete work completed. Description of work, \$80 allotted. A 3-inch artesian well sunk to a depth of 90 f. 99, 876.

Savannah, Ga.—Emplacement for 6-inch R. F. gun.

1898. \$9,000 allotted. Work begun and practically completed; minor work, including mounting of gun and carriage, to be done, 98, 710.

1899. \$5,582 allotted. Parapet sodded, gun and carriage mounted and the

completed battery turned over to the artillery, 99, 876.

Savannah, Ga.—Platform for 8-inch rifle.

1898. \$2,800 allotted. Temporary platform for 8-inch B. L. rifle built of concrete in one of the old forts, and gun and carriage mounted, 98, 710.

1899. Gun dismounted and carriage shipped away by the ordnance officer, 99, 880.

Savannah, Ga.—Rapid-fire emplacement.

1898. \$180.71 allotted. Work begun, some materials purchased and some excavation made. Notice received that guns could not be procured, work stopped, and materials transferred to other works. 98, 710.

Savannah, Ga.—Rapid-fire emplacement at Wassaw Sound.

1898. \$11,000 allotted. Work begun. Two emplacements for 4.72-inch guns mounted, and battery completed at end of fiscal year. 98, 711.

1899. Guns dismounted and removed to a permanent site, 99, 880.

Brunswick, Ga.—Temporary defenses.

1898. \$12,000 allotted. Temporary batteries built at south end of St. Simons Island, and one east of it; north end of Jekyll Island, and one at south end of Jekyll Island, 98, 712.

1899. Artesian well sunk on Jekyll Island, and one at St. Simons Island. Magazines, etc., repaired. 99, 882.

Darien, Ga.—Temporary defenses.

1898. \$10,000 allotted. Battery at south end of Sapelo Island; magazine built, and parapet and magazine covered with grass sod; small well driven and supplied with pump. Battery at north end of Blackbeard Island; magazine built with timber and covered with sand. 98, 712.

1899. Batteries damaged by storm; repairs made, 99, 882.

Cumberland Sound.—Emplacement for 8-inch B. L. rifle.

1898. \$4,500 allotted. Work begun on mounting 8-inch B. L. rifle on a modified 15-inch S. B. carriage; old pintle stone removed, and a retaining wall of brick concrete built back of the emplacement; 1,500 c. y. sand placed in parapet, 98, 713.

1899. \$2,825 allotted. Platform and sand fill completed; 15-inch carriage altered; gun mounted; and ammunition crane erected, 99, 887.

GEORGIA AND CUMBERLAND SOUND—Continued.*Cumberland Sound.—Temporary batteries.*

1898. \$1,600 allotted. Front of the old work filled in; sand causeway built across moat at the sally port and cisterns baled out and filled with sand; artesian well sunk 386 f.; minor work, **98**, 713.

Fernandina, Fla.—Temporary batteries.

1898. \$2,000 allotted. Battery built at the north end of Little Cumberland Island. **98**, 714.

Savannah, Ga.—Emplacements for eight 12-inch mortars.

1899. \$108,132 allotted. Work begun in Dec., 1898; excavation and nearly all of concrete work completed; description and cost of material and labor. **99**, 871.

1900. \$17,310 allotted. Guns mounted, and battery, built of Portland cement, completed and turned over to the artillery; cost, \$125,442; summary of work. **1900**, 917.

Savannah, Ga.—Emplacements for two 4.7-inch R. F. guns.

1899. \$14,800 allotted. Guns were temporarily mounted at defense of Wasaw Sound, then transferred to a new site in process of construction. Nearly all concrete work completed. **99**, 875.

1900. \$1,585 allotted. Guns mounted and battery completed. Summary of work. **99**, 919.

Savannah, Ga.—Site 1—Emplacements for two 15-pounder R. F. guns.

1899. \$100 allotted. No work. **99**, 878.

1900. \$9,430 allotted. Work begun Oct. 10, 1899, and battery completed by Mar. 31, 1900, except setting fixed iron-work for guns. Summary of work. **1900**, 920.

Savannah, Ga.—Site 2—Emplacements for two 15-pounder R. F. guns.

1899. \$12,800 allotted for protection of mine fields. 1,800 c. y. sand placed in foundations, also 30,000 old brick. A 3-inch artesian well, 122 feet deep, driven. Minor work. **99**, 880.

1900. Battery completed and awaiting arrival of guns, **1900**, 921.

Miscellaneous.*Savannah, Ga.—Overhauling 15-inch gun and repairing platform.*

1898. \$1,950 allotted. Two 15-inch guns and their carriages lifted out of the emplacements, timber platforms replaced by concrete ones, and guns and carriages remounted, **98**, 711.

1899. \$313.12 allotted, **99**, 880.

Removing Material from Temporary Batteries.

1899. \$500 allotted for cleaning guns, painting carriages and removing ammunition and appliances from Brunswick and Darien defenses. Work completed, **99**, 883.

Preservation and repair.

1898. Cumberland Sound.—\$500 allotted for placing armament in serviceable order, repairing magazines, and for minor work. Savannah Harbor.—\$500 allotted to improve the sanitary condition of one of the forts. **98**, 716.

1899. Savannah Harbor.—\$1,050 allotted; ditches cleaned and the sand beach in front of batteries seeded, **99**, 979. Parrott guns and carriages cleaned, wharf repaired; minor work, **99**, 881. Cumberland Sound.—\$1,175 allotted for repairs to buildings, etc., **99**, 887.

1900. \$7,645 allotted. 12-inch emplacement—artesian well sunk 155 f. Brush placed on sand to hold it down, and minor repairs. 8-inch emplacement—cracks closed, iron work painted, machinery repaired; minor work. 6-inch battery—steps leveled, ceiling beams painted; minor work. 4.7-inch battery—ceiling beams painted, sand areas covered with stable manure and seeded; minor work on electrical apparatus, **99**, 920, 921. Site No. 2.—\$750 allotted; cleaning ditches and moat, electrical apparatus and torpedo material; minor work, **1900**, 922.

Range and position finders.*Savannah, Ga.*

1899. \$50 allotted. One range finder installed, **99**, 878.

Submarine mines.

1894. Savannah, Ga.—Mining casemate costing \$8,012.39 completed, **94**, 10.

1898. \$200 allotted—inverted arches below two adjacent casemates of the same fort cleaned and converted into tanks, **98**, 711. \$2,500 allotted—temporary operating room built in sand dunes and shrubbery. \$4,500 allotted for purchasing explosives and planting mines; mines planted, **98**, 714.

1899. Savannah, Ga.—\$650 allotted for cable tank, **99**, 88. \$500 allotted for removing mine material, cleaning, and storing same, **99**, 881. \$2,500 allotted—temporary mining casemate built; minor work. 2 mines lost, **99**, 882. Cumberland Sound.—\$2,000 allotted for planting and removing mines and caring for the torpedo material. All mines removed by exploding them, **99**, 887.

1900. All torpedo material cleaned and stored, **1900**, 921, 922.

GERRISHS ISLAND, ME. (Barbette battery). (See *Portsmouth Harbor, N. H.*)

GORGES. (See *Maine Coast.*)

GOVERNORS ISLAND. (See *Fort Winthrop, Boston Harbor, Mass.; New York Harbor, U. S. Mastic Works.*)

GRATIOT. (See *Lake Ports.*)

GREAT DIAMOND ISLAND, ME. (See *Maine Coast.*)

GREAT HOG ISLAND BATTERIES. (See *Maine Coast.*)

GREEN. (See *Massachusetts.*)

GRISWOLD. (See *Long Island Sound.*)

HALE. (See *Long Island Sound.*)

HAMILTON. (See *New York Harbor.*)

HAMPTON ROADS, VA.

Contracts.

1887. Wharf, \$88,305, 88, 808.
 1889. Storehouse, \$7,440, 90, 386.
 1897. Tower and wooden building for range finder, \$1,179, 97, 660.
 1898. Electric-light plant, \$44,200, 98, 685.
 1899. Concrete storage tank, \$1,769.-50, 99, 840.
 1900. American cement, 66½ cents per barrel; Portland cement, \$2.30 per barrel; broken stone, \$1.389 per c. y.; granolithic stone, \$1.389 per c. y.; Rosendale cement, \$1.05 per barrel, 1900, 888, 891.

Engineering features.

Concrete mixing, 99, 843.
 Flash plates, 99, 835.
 Materials, detailed cost of, 97, 657, 658, 660; 98, 684; 99, 844; 1900, 888.
 Mines, method of unloading, 99, 842.
 Range-finder tower, description of, 97, 661.
 Sewerage system, report on, with detailed cost, 97, 663.
 Ventilating system, description of, 1900, 893.
 Waterproofing, 98, 679; 1900, 893.

Engineers.

CHIEF OF ENGINEERS. 66, 13; 67, 12; 68, 15; 69, 15; 70, 22; 71, 18; 72, 15; 73, 16; 74, 19; 75, 19; 76, 21; 77, 17; 78, 20; 79, 24; 80, 40; 81, 39; 82, 36; 83, 32; 84, 37; 85, 31; 86, 30; 88, 107;

89, 12; 90, 9, 385; 91, 8, 10, 530; 92, 8, 10, 465; 93, 9, 635; 94, 10, 14; 95, 9, 508; 96, 16, 492; 97, 16, 657; 98, 23, 679; 99, 25, 834; 1900, 23, 886.

BOARD OF ENGINEERS:

Constituted, 1882, to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with. Report, 82, 421.

Constituted, 1886, by S. O., No. 268, Nov. 17, 1886, to select and report upon site and plan for wharf. Report, 88, 806. (Col. Tidball and Lt. Col. Chandler and Hains.)

ENGINEERS IN CHARGE:

Col. H. Brewerton, 1866-70.
 Maj. W. P. Craighill, 1870-75.
 Col. Q. A. Gillmore, 1875-86.
 Capt. J. C. Post, 1883.
 Lt. Col. P. C. Hains, 1887-92. Reports, 88, 804; 89, 463; 90, 385; 91, 529.
 Maj. L. C. Overman, 1892.
 Capt. T. Turtle, 1892.
 Maj. C. E. L. B. Davis, 1892-96.
 Maj. T. L. Casey, 1896.
 Maj. J. B. Quinn, 1900.

ASSISTANTS:

Lt. G. A. Zinn, 1891-94.
 Lt. D. DuB. Gaillard, 1895; (Capt.) 1896.
 Lt. C. A. F. Flagler, 1896.
 Lt. C. W. Kutz, 1896-97.
 Lt. F. A. Wilcox, 1898-99.
 Lt. E. H. Shultz, 1898.

HAMPTON ROADS, VA.—Continued.

Forts and batteries.^a—Operations.*Fort Monroe, Old Point Comfort, Va.***1817.** Work begun, 80, 40.**1866.** Reinforcement of gun platforms; regrading ramp surfaces; alterations made to adapt water battery to the new 10-inch gun armament; several front pintle platforms for 15-inch guns built in the covered way, and minor work, 66, 13.**1867.** Relaying platforms; bridges, stone pavements, and slopes, etc., repaired; repairing embrasures, removing traverse circles, and constructing 18 projectile platforms of water battery, 67, 12.**1868.** Repairs to floors and embrasures of casemates, terreplein, slopes, and ramp, and grading roadway; repairs to roofs of casemates in water battery and covered way, and minor repairs; 490 f. of wooden breast height repaired or rebuilt in the redoubt; a stone wall 80 f. long built to support foot of glacis, and repairs to slopes, 68, 16.**1869.** Center pintle platforms for 15-inch guns built in front 4, and parapet increased in thickness; front pintle platform for 15-inch gun built in covered way; grading 1,000 l. f. of roadway; work on drains, cleaning scarp walls, and repairing terreplein slope and ramps. Water battery—repairs to roofs of casemates, rebuilding part of sustaining wall in rear of two platforms, and minor repairs. 69, 15.**1870.** Modification plans prepared. General repairs to pavements, cisterns, terrepleins, ramps, roadway, and breakwater. 70, 22.**1871.** General repairs. Summary of work. 71, 18.**1872.** \$42,500 appropriated. Repairing and rebuilding 3 15-inch gun platforms; replacing pintle stones injured by experimental firing of 1871; rebuilding 2 front pintle 15-inch gun platforms in covered way, and minor work. 72, 15.**1873.** \$40,000 appropriated. 6 shot furnaces removed. 2 casemates floored and plastered for officers' use. 2 cisterns built; repairs to breakwater, ramps, terreplein, casemate, etc. Work begun on modification plans; 6,000 c. y. sand

placed. Board of Engineers estimated it would cost \$250,000 for permanent barracks. 73, 16.

1874. \$30,000 appropriated. Masonry of magazine and foundations of 2 gun platforms completed; work on masonry of traverse magazine, and sand placing in the redoubt. Summary of work. Project for battery of 10 guns of heaviest caliber, exterior to fronts 2 and 3, and for a battery of 2 guns on fronts 1, 2, 3, and 4 of main work. 74, 19.**1875.** \$20,000 appropriated. Platforms Nos. 5 and 6, and two service magazines completed; parapet raised and graded; piers of postern bridge repaired and entire superstructure of bridge rebuilt; repair of wooden breakwater. 75, 19.**1876.** Platforms and breast-height walls in advanced redoubt nearly completed. Work on terrepleins and slopes and roadways. 3 platforms for heavy guns and 15 for lighter ones ready for armament. 76, 21.**1877.** Breakwater repaired. Preservation and repair. Armament—10-inch Rodman guns dismounted from platforms 87, 88, 89, and 93; 100-pounder Parrott rifles dismounted from platforms 91, 92, and 94, and mounted on platforms 87, 88, and 89. 8-inch converted rifle guns mounted on platforms 91, 92, 93, and 94. 77, 17.**1878.** Repair of bridges and breakwater. Timber 13-inch sea-coast mortar platform laid, fronts 4 and 5. 78, 20.**1879.** Boathouses and bridges repaired, 79, 24.**1880.** Description of fort. Repair of parapet, slopes, etc. 80, 40.**1881-84.** General repairs. Summary of work. 81, 40; 82, 37; 83, 32; 84, 39.**1885.** Breast-height wall and parapet on fronts 4 and 5 repaired and completed; replacing 5-inch pintles with 6-inch pintles. Permanent platforms for 10-inch Rodman guns Nos. 51 and 52 on barbette of main work completed. Minor work. Summary of work. 85, 31.**1886.** Platform No. 96 put in serviceable order; numerous repairs. Summary of work. 86, 30.^a List of works as arranged under this head—

Fort Monroe, Old Point Comfort, Va.

Fort Wool, formerly Fort Calhoun.

Redoubt A.—Emplacements for 10-inch guns.

Redoubt A.—Emplacement for one 10-inch gun.

Redoubt A.—Mortar battery, sixteen 12-inch mortars.

Redoubt B (left half).—Emplacement for 10-inch gun on spit.

Redoubt A.—Platform for 8-inch rifle on A. R. F. barbette carriage.

Redoubt B-C.—Three 10-inch gun emplacements.

Four 4.72 inch R. F. gun emplacements.

Platforms for four 8-inch rifles on parapet.

Emplacement for 10-inch gun in bastion.

Battery for three 12-inch guns.

Emplacements for four 16-pounder R. F. guns.

HAMPTON ROADS, VA.—Continued.

Fort Wool, formerly Fort Calhoun.

1818. Work begun, 80, 41.

1858. Work resumed, 80, 41.

1866. Work on the masonry of the scarp and piers. Summary of work. 66, 14.

1867. Preparations for building the magazine of the first tier at the capital at the east and west ends. Summary of work. 67, 12.

1868-69. Work on construction of magazines of first tier. Summary of work. 68, 16; 69, 16.

1870. Projects for completion being prepared. Work on magazine of first tier and superstructure of magazine at west end; stairway and passage finished; minor work. Casemates Nos. 2 to 53, inclusive, of first tier ready for guns. 70, 22.

1871-78. Operations suspended, Aug., 1870. Preservation and care. 71, 19; 72, 15; 73, 17; 74, 20; 75, 20; 76, 21; 77, 17; 78, 20.

1879. Repair of wharf and fort keeper's quarters. Board of engineers prepared modification plans for heaviest armament. 79, 24.

1880-86. Description and importance of fort. Preservation and repair. 80, 41; 81, 41; 82, 38; 83, 34; 84, 40; 85, 32; 86, 32.

1898. \$425 allotted, 1897. Preservation and care. 98, 688.

1899. \$1,260 allotted. Preservation and care. 99, 841.

Redoubt A.—Emplacements for 10-inch guns.

1892. \$158,848 allotted 1891. Work begun placing concrete. 92, 8.

1893. Concrete for parapet in place and half of earthwork on the front completed, 93, 9.

1894. Emplacements for 2 guns completed; awaiting carriages, 94, 10; 95, 9.

1896. \$3,774 received from other works for completing the emplacements. \$10,292 allotted for constructing 2 platforms; were completed. Summary of work. 96, 492.

1897. \$1,300 allotted. Guns and carriages received; mounted by the garrison. Summary and detailed cost of work. Total cost, \$154,379.99. 97, 656.

1898. \$1,605 allotted. Waterproofing magazines, planting hedge in rear of battery, and installing electric-light plant. 98, 679.

Redoubt A.—Emplacement for one 10-inch gun.

1893. \$64,000 allotted in 1892. Work begun. 93, 9.

1894. Emplacement completed; awaiting carriage, 94, 10.

1896. \$9,774 transferred to other works. \$5,020 allotted for constructing platform; practically completed. Summary of work. 96, 493.

1897. Carriage and gun received, mounted, and turned over to the commanding officer. Work completed. Summary and detailed cost of work. Total cost, \$59,246. 97, 658.

1897. \$552.50 allotted. Waterproofing magazine, and installing a small chloride electric storage battery. 97, 680.

Redoubt A.—Mortar battery, sixteen 12-inch mortars.

1895. \$100,000 allotted. Work begun on repair of wharf. 95, 9.

1896. Plans modified, repair of wharf completed, and plant constructed, 96, 494.

1897. \$100,000 allotted. All concrete in the pits, wing walls, and main work, and 20,200 c. y. sand placed. Summary and detailed cost of work. 97, 659.

1898. Mortars mounted. Work completed; 21,741 c. y. concrete placed. Detailed cost of work. Mortars fired. 98, 683.

1899. Because of dampness in main magazine, 2 small temporary magazines built at cost of \$1,299.60. Description. 99, 839.

1900. \$1,246 allotted. Waterproofing. Ventilating system, description of. Concrete steps placed up the slope of center traverse. 1900, 893.

Redoubt B (left half).—Emplacement for 10-inch gun on spit.

1897. Plans being made for 10-inch gun mounted on an experimental disappearing carriage, model 1894, 97, 659.

1898. \$50,000 allotted. Work begun, and 2,623 c. y. of concrete and 12,038 c. y. sand cover placed. 98, 680.

1899. Battery nearly completed; gun and carriage received, but not mounted. Summary of work. 99, 835.

1900. Gun mounted by garrison and tested; electric plant partly installed and minor work, 1900, 886.

Redoubt A.—Platform for 8-inch rifle on A. R. F. barbette carriage, model 1892.

1898. \$1,800 allotted. Rifle, mounted for some time on a platform at northern end of water battery for target practice, transferred to a platform behind the cover of the mining casemate. 210 c. y. of concrete placed in platform. Work completed, cost \$1,608.08. 98, 686.

Redoubt B-C.—Three 10-inch gun emplacements.

1898. \$125,000 allotted. Work begun. Redoubt C, 3,725 c. y. concrete

HAMPTON ROADS, VA.—Continued.

and 2,186 c. y. sand placed. Right half of redoubt B, 1,067 c. y. concrete and 10,390 c. y. sand placed. 98, 689.

1899. \$5,000 allotted for completion; 3 emplacements practically completed; armament in place. Summary and cost of work. 99, 836, 843.

1900. Slope completed; setting up storage battery, 1900, 889.

Four 4.72-inch R. F. gun emplacements.

1898. \$18,000 allotted. Plans modified. Work begun on platforms on barrette tier. 5 old platforms removed; 3 new platforms completed. 98, 690.

1899. All guns mounted, and a magazine to serve them built in the interior slope of main work; cost of platform and magazine, \$2,777.01, 99, 845.

Platforms for four 8-inch rifles on parapet.

1898. \$8,000 allotted. Work begun on temporary platform and completed, and guns mounted. 5 old platforms and material removed. 98, 690.

1899. Two carriages and guns removed from platforms and shipped to other points, 99, 845.

Emplacement for 10-inch gun in bastion.

1899. \$38,000 allotted. Work begun dismounting 3 old guns. 3,058 c. y. concrete placed. 99, 836.

1900. Work nearly completed. Gun and carriage received, and part of carriage assembled. Detailed cost of work. 1900, 888.

Battery for three 12-inch guns.

1899. \$150,000 allotted. Work begun. 8,500 c. y. sand placed for filling; 8,834 c. y. concrete placed. 99, 837.

1900. Battery, except minor work, completed; awaiting completion of assembling 4 carriages. Summary of work. 1900, 889.

Emplacements for four 15-pounder R. F. guns.

1900. \$12,500 allotted. Work begun placing 1,349 c. y. of sand for filling. Battery practically completed. 1900, 890.

Miscellaneous.

Electric plant.

1899. \$960 allotted for supplies for operating. Plants in operation six months ending Jan. 1, 1899. Description of plant. 99, 842.

Iron pile bridge over Mill Creek, Fort Monroe, Va.

1889. \$20,000 appropriated for bridge between the military reservation

of Fort Monroe and Elizabeth City County, Va. Description of proposed bridge. 89, 12, 466.

1890. Work begun under contract and practically completed in May. Contract price, \$17,500. 90, 387.

Reinforcing water battery magazines.

1898. \$300 allotted. 263 c. y. sand placed in retaining wall, and cribs built. 98, 691.

1899. 320 c. y. earth placed as cover for magazines, 99, 845.

Sewerage system, Fort Monroe.

1891. \$25,000 appropriated, 1889, 91, 10, 531.

1892. Secretary of War decided that two systems be constructed, one by the United States and the other by residents of the reservation, 92, 465.

1893. Discussion as to the best method of drainage, 93, 14, 642.

1895. \$37,500 appropriated, 1894, for one-half of construction, the cost of the other half to be paid by the nonmilitary residents. Work begun; contract, \$34,482.50. 4,391 f. of 6-inch and 8-inch sewer pipe laid. 15 manholes and about 10 c. y. of concrete and brick masonry placed. 95, 9, 511.

1896. Sewerage system completed. Summary of work, 96, 498.

1897. Post quartermaster at Fort Monroe assumed charge of operation and maintenance. Total cost, \$49,527.31. Report of receipt and expenditures of construction and maintenance. 97, 663.

Wharf at Fort Monroe.

1889. \$175,000 appropriated. Work begun under contract in August 1888. Plans modified for steel piles instead of wooden ones, nearly all the piles placed, and half the flooring laid. Summary of work. 89, 12, 464.

1890. Wharf completed in September, 1889, and custody transferred to the Quartermaster's Department Dec. 4, 1889. Cost of materials. Storehouse on wharf nearly completed under contract, \$7,439.67. 90, 386.

1891. Construction of pile jetty in progress, 91, 530.

Preservation and repair.

1898. \$3,500 allotted. Repairs of bridges, walks, and quarters. 98, 688.

1899. \$3,266.45 allotted for general repairs, 99, 840.

1900. \$1,936.59 allotted for repair of bridges, torpedo material, and minor work. Summary of repairs. 1900, 896.

Range and position finder stations.

1897. \$1,800 allotted for tower and

HAMPTON ROADS, VA.—Continued.

shelter. Work begun and completed under contract; turned over to the commanding officer. Description of work. 97, 661.

1898. \$500 allotted for two observation stations; both completed, and instruments installed, 98, 686.

1900. \$100 allotted to enable data to be furnished the Board on Location of Position Finders as to elevations, etc., of sites selected for the construction of completed range towers. 1900, 894. Plans for battery commander's station near mortar battery being prepared. 1900, 895.

Sea walls and embankments.

Fort Monroe.

1891. \$37,000 appropriated for beach protection. Work begun under contract on a pile jetty. 91, 10, 530.

1892. Work on 4 jetties and sea wall. Summary of work. 92, 466.

1893. 4 jetties built; work suspended, 93, 510.

1895. \$9,100 allotted for sea wall near old pile breakwater; 272 l. f. of sea wall built. Work described. 95, 508.

1896. Breakwater completed; cost, \$6,967.43. Summary of work. 96, 495.

1900. \$12,000 to be provided for constructing about 900 f. of wall, 1900, 895.

Sites.

Willoughby Point, Va.

Tract of 47 acres and 2 rights of way purchased for \$23,500, 92, 10.

Submarine mines.

1891. Concrete work of mining casemate completed; sand cover being placed, 91, 8.

1892. Casemate completed; cost, \$29,452, 92, 8; 93, 9.

1898. \$21,150 allotted, 1897. Second casemate begun in 1897; casemate and gallery completed. Summary of work. 98, 686. Cable storage tank built; cost,

\$2,072.79, 98, 687. \$27,000 allotted for torpedo defenses; mines planted and cared for. Electrical firing apparatus set up in casemate. 98, 692.

1899. \$116.85 expended for fitting up an unused casemate of the main work for storing torpedo material and providing racks for 200 torpedoes, compound plugs, anchors, etc., 99, 839. \$2,000 allotted for extending cable tank; work completed; cost, \$1,962.15, 99, 840. \$18,000 allotted for removing mines; most of them removed by exploding them on the surface of water. Material cleaned and stored. 99, 841.

1900. \$1,000 allotted for supplies for sea-coast defenses, 1900, 895.

Water supply.

1868. Artesian well begun in 1864-65 with a 12-inch pipe. 186 f. of 5-inch pipe and 120 f. of 8-inch pipe withdrawn from well of 1845, the 8-inch pipe to be driven inside the 12-inch pipe of the new well. Well 370 f. deep. 68, 16.

1869. Work continued on sinking the 8-inch pipe till the lowest section separated from the rest, at depth of 517 f., then tubes 4½ inches diameter, with screw ends, inserted in the 8-inch pipe and driven to depth of 570 f., where a limited amount of saline water was found, 69, 15.

1870. Work continued on sinking the 4½-inch tubing. Total depth, 900 f. 70, 22.

1871. Well driven to depth of 906½ f. below level of parade at Fort Monroe. Work suspended in August, 1870. Plant cared for. 71, 18.

1872. Work resumed October, 1871, by drilling instead of boring, 72, 15.

1873. Little progress made. Work suspended. 73, 16.

1891. \$6,000 appropriated for new well. Estimates of \$4,000 more required before beginning work. 91, 10, 530.

1892. Description of previous work, 92, 467.

1893. Description of previous work and wells in other localities. 93, 13, 635.

HUDSON. (See *New York Harbor.*)

INDEPENDENCE. (See *Boston Harbor, Mass.*)

JACKSON. (See *Georgia; New Orleans, La., etc.*)

JAMES ISLAND (FORT JOHNSON). (See *South Carolina, coast of.*)

JEFFERSON. (See *Florida.*)

JEFFERSON BARRACKS, MO.**Engineers.**

CHIEF OF ENGINEERS. Reports, 66, ii, 19; 67, 15; 68, 22; 69, 21; 70, 29; 71, 28; 72, 28; 73, 29.

OFFICERS IN CHARGE:

Capt. W. Ludlow, 1867-68.

Capt. P. C. Hains, 1868-71.

Operations.

1868. The post of Jefferson Barracks (about 300 acres of land) transferred to the Corps of Engineers by G. O., No. 9, dated Oct. 21, 1867, Hqrs. Military Division of the Missouri. \$20,000 paid to the Quartermaster's Department for the

property. Alterations to barracks and repairs to buildings. 68, 22.

1869-70. Work on quarters in progress, 69, 21; 70, 29.

1871. Company E reduced and reorganized; left for West Point Mar. 1, 1871. Engineer property left under the care of a small detachment of Engineer soldiers. Post, with all lands appertaining thereto, transferred to the Ordnance Department. 71, 28.

1873. Engineer material stored at the post disposed of by auction in June, and the detachment left to guard it was ordered to Willets Point, 73, 29.

JERRYS POINT (barbette battery). (See *Portsmouth Harbor, N. H.*)

JOHNSON. (See *South Carolina.*)

KENNEBEC RIVER, ME. (See *Maine Coast.*)

KEY WEST, FLA. (See *Florida, East Coast, and Key West.*)

KITTERY POINT, ME. (See *Portsmouth Harbor.*)

KNOX. (See *Maine Coast.*)

LAKE CHAMPLAIN (Outlet of). (See *Lake Ports.*)

Engineering features.

Prevention of percolation of water, with patent granite laid in hot mastic, 97, 744. Not satisfactory, 98, 774.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 3; 67, 4; 68, 7; 69, 7; 70, 12; 71, 7; 72, 4; 73, 5; 74, 6; 75, 6; 76, 7; 77, 5; 78, 7; 79, 9; 80, 19; 81, 16; 82, 11; 83, 7; 84, 13; 85, 7; 86, 7; 87, 20, 743; 88, 29, 773; 89, 33, 974; 1900, 30, 973.

ENGINEERS IN CHARGE:

Capt. C. B. Reese, 1866-67.

Lt. Col. C. E. Blunt, 1866-68.

Capt. J. W. Barlow, 1868-70.

Lt. Col. J. Newton, 1870-77.

Capt. J. Mercur, 1877-78.

Col. H. W. Benham, 1878-82.

Maj. W. McFarland, 1883.

Lt. Col. H. M. Robert, 1883-85.

Maj. M. B. Adams, 1885-86.

Maj. W. S. Stanton, 1897-98.

Lt. Col. A. M. Miller, 1898-99.

Col. J. W. Barlow, 1899-1900.

Forts and batteries.—Operations.

Fort Montgomery, N. Y.

1841. Work begun, 80, 19.

1866. Stone and earthen parapet and breast-height wall of the land front completed; setting parade wall coping and turning floor arches; embanking terre-

plein and cover-face; constructing masonry barbette platforms (20), and excavating the moat, 66, 3.

1867. 17 barbette gun platforms completed; scarp wall of the fort completed, and minor work; the fort is ready for part of its armament, 67, 4.

1868. Flagging for first and second stories of bastions C and D completed; raising south end of parade wall; constructing revetment wall of cover-face, and minor work, 68, 7.

1869. Staircase and south end of parade wall raised; quarters and drainage under construction; the stone facing of west salient of cover-face completed, and minor work, 69, 8.

1870. Completion of staircase bastion C, parade walls, asphaltic covering, and terrepleins of curtains 2 and 3; turning four arches of second-story floors of curtain 3, and completing earthen parapet of right flank bastion B, 70, 12.

1871. Projects for modification for modern guns prepared by Board of Engineers, approved, 71, 7.

1872. Slight repairs made to magazines, retaining walls; general care of work, 72, 4.

1873. Minor work, 73, 5.

1875. 6 shot and shell beds built on parade, and repairs made to earthen parapet, footbridge over marsh, and cavities in causeway and revetment, 75, 6.

LAKE CHAMPLAIN (Outlet of)—Continued.

1876. Parade graded, bridge built in main postern, causeway repaired, and parapet sodding begun, 76, 7.

1877. Earthen parapet part resodded, asphalt covering repaired, and tie rods for strengthening north face of bastion D placed, 77, 5.

1878. Tie rods placed on curtain 3. 78, 7.

1879. Care and preservation, 79, 9.

1880. Bridge and wharf roadway repaired; causeway and parade raised and graded. 80, 19.

1881. Asphalt covering of curtains 1, 2, 4, and 5, and of bastions B, C, D, and E around the staircase, and wooden stair roofings, repaired; casemate doors painted and terreplein graded. 81, 17.

1882. Repair of asphalt covering of curtains Nos. 1, 2, 3, 4, and 5; brick arches of embrasures of second tier repaired and

repointed, and minor repairs made. 82, 12.

1884. Tie-rods placed in curtains 1, 3, 4, and 5, for fastening the scarp wall to the casemates to prevent leakage into magazines. 84, 13.

1885. Wooden shutters fitted to embrasures and loophole openings, water-front sally-port gateway repaired, and interior gates placed at the land-front sally-port entrance. 85, 7.

1886. 5 center pintle and 6 front pintle platforms repaired; woodwork of bridge over moat renewed. 86, 7.

1897. 103 f. of parade wall covered with patent granite roofing laid in hot mastic to prevent the percolation of water. 97, 744.

1898-1900. Care and preservation, 98, 774; 99, 975; 1900, 973.

LAKE PORTS. (See *Buffalo, N. Y.*; *Detroit River, Fort Gratiot Military Reservation, Mich.*; *Fort Niagara, N. Y.*; *Fort Ontario, Oswego, N. Y.*; *Lake Champlain, and Niagara River.*)

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 2; 67, 3; 68, 6; 69, 7; 70, 11; 71, 3; 72, 3; 73, 4; 74, 6; 75, 5; 76, 6; 77, 4; 78, 6; 79, 8; 80, 18; 81, 14; 82, 9; 83, 5; 84, 10; 85, 5; 86, 6; 99, 33, 974; 1900, 30, 973.

BOARD OF ENGINEERS, 1885. Report, 86, 509.

ENGINEERS IN CHARGE:

Col. T. J. Cram, 1866-70.
Maj. W. McFarland, 1870-71.
Maj. G. L. Gillespie, 1871-73.
Maj. F. Harwood, 1873-74.
Lt. Col. C. E. Blunt, 1875-78.
Maj. W. McFarland, 1878-83.
Lt. Col. H. M. Robert, 1883.
Lt. Col. O. M. Poe, 1884-86.
Lt. Col. G. J. Lydecker, 1889-1900.

LAZARETTO POINT. (See *Baltimore, Md.*)

LIME POINT (Fort at). (See *San Francisco, Cal.*)

LITTLE HOG ISLAND (New work, barbette battery). (See *Maine coast.*)

LIVINGSTON. (See *New Orleans, La., etc.*)

LONG ISLAND (Head battery). (See *Boston Harbor, Mass.*)

LONG ISLAND (Seven-gun battery). (See *New York Harbor.*)

LONG ISLAND SOUND (Eastern entrance to) AND COAST OF CONNECTICUT.

Contracts.

1897. Two 12-inch emplacements and wharf 80. 97, 609.

1898. Entire electric plant for 2 12-inch emplacements, \$5,290, 98, 613; 2 10-inch emplacements with casemate and wharf, \$102,427, 98, 615; electric apparatus complete for 10-inch emplacement, \$2,710.38, 98, 615; Hornsby-Akroyd oil engine and belt, \$1,695, 98, 615.

1899. Small stone, \$1.18 and \$1.24 per c. y.; proposals for construction materials. 99, 753.

1900. Electric-light plant for mortar battery, \$6,482, 1900, 818; 6-inch emplacements—5 hoists and doors, \$2,765; 10-inch emplacements—2 hoists and doors, \$1,807; 12-inch emplacements—2 hoists and doors, \$1,847, 1900, 820, 825; electric-light plant for 2 8-inch and 2

LONG ISLAND SOUND (Eastern entrance to) AND COAST OF CONNECTICUT—Continued.

5-inch emplacements, \$1,451, 1900, 821.

Engineering features.

Concrete mixing and placing, 98, 620, 622; 99, 751; 1900, 821, 823.

Concrete plant, arrangement of. 98, 620.

Electric plant, installing of. 1900, 824.

Mixer, "gravity," 99, 751; 1900, 821.

Mounting guns and carriages. 1900, 824.

Plant, approximate value of, 99, 761; 1900, 827.

Plant, description of. 1900, 823.

Sea wall, stability of, movement of bar, 99, 757; 1900, 822.

Submarine mines, preparation of material, novel features, operation, and testing. 98, 616, 618.

Waterproofing methods. 1900, 815, 816, 821, 824.

Engineers.

CHIEF OF ENGINEERS. Reports, 36, 7; 67, 7; 69, 11; 70, 16; 71, 12; 72, 9; 73, 9; 74, 10; 75, 10; 76, 11; 77, 8; 78, 10; 79, 13; 80, 25; 81, 23; 82, 19; 83, 15; 84, 21; 85, 15; 86, 15; 96, 13; 97, 13, 608; 98, 18, 612; 99, 19, 747; 1900, 17, 814.

BOARD OF ENGINEERS:

Constituted, 1882, to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with. Report, 82, 418.

Reports, 90, 7; 93, 15.

ENGINEERS IN CHARGE:

Capt. S. M. Mansfield, 1866-67.

Maj. D. C. Houston, 1867-70.

Maj. G. K. Warren, 1870-74.

Capt. A. H. Holgate, 1870.

Maj. J. W. Barlow, 1875-83.

Lt. Col. W. McFarland, 1883-86.

Lt. Col. D. C. Houston, 1886.

Maj. S. S. Leach, 1896-1900.

ASSISTANTS:

Lt. W. J. Barden, 1897-1900.

Lt. E. H. Schulz, 1900.

List of works as arranged under this head—

New London Harbor, Conn.—Fort Trumbull.

New London Harbor, Conn.—Battery at Fort Griswold, Groton, Conn.

New Haven Harbor, Conn.—Fort Hale.

Emplacements for two 12-inch guns on disappearing carriages.

Two emplacements for 10-inch rifles, disappearing carriages and a mining casemate.

Emplacements for eight 12-inch B. L. mortars.

Temporary defenses at Bridgeport, New Haven, New London, and at Stonington.

Emplacements for two 10-inch B. L. rifles on disappearing carriages, model 1896.

Emplacement for 4.7-inch R. F. gun.

Emplacements for two 8-inch B. L. rifles on barbette carriages.

Two emplacements for 6-inch R. F. guns on disappearing carriages.

Two emplacements for 8-inch B. L. rifles, and two for 5-inch R. F. guns.

Emplacements for two 12-inch B. L. rifles, two 10-inch B. L. rifles, and three 6-inch R. F. guns.

Emplacements for two 5-inch R. F. wire-wound guns, with parados.

Emplacements for two 5-inch R. F. wire-wound guns.

Forts and batteries.^a—Operations.

New London Harbor, Conn.—Fort Trumbull, at "Fort Point."

1838. Work begun on casemated work, 80, 25.

1848. Work completed, 82, 19.

1866. Care of fort keeper, 66, 7.

1867. Care and preservation, 67, 7.

1869. Repointing the parade wall, 69, 11.

1870. Modification plans for 12 15-inch guns or equivalent rifles. Estimated cost, \$58,000. Minor work. 70, 17.

1874. \$25,000 appropriated. Minor repairs. 74, 11.

1875. \$20,000 appropriated. Modification work begun. Work on north exterior battery. 75, 10.

1876. North exterior battery completed, except setting platform irons and placing the magazine lamps, 76, 11.

1877-79. Care and preservation, 77, 8; 78, 10; 79, 13.

1880. History of fort; care and preservation, 80, 25.

1881. Repairs to recess and embrasure arches, parapet, and roads, 81, 24.

1882. Preservation and repairs, 82, 19.

1883. Work on sea wall, 83, 16.

1884. History and description; work on sea wall, 84, 21.

1885. Drainage work, 85, 15.

1886. History and description, 86, 15.

1896. Two 15-inch S. B. guns mounted, 98, 612.

1899. Sewer laid by city of New London, 99, 747.

1900. Description of fort, 1900, 814.

New London Harbor, Conn.—Battery at Fort Griswold, Groton, Conn.

1840. This barbette earthen work begun, 80, 26.

1870. Modification plans prepared for 9 15-inch guns. Estimated cost, \$40,000. Work on shot beds. 70, 17; 83, 16.

LONG ISLAND SOUND (Eastern entrance to) AND COAST OF CONNECTICUT—Continued.

1876. Survey made of the boundaries of the U. S. lands, 76, 11.

1877. Merestones replaced, 77, 8.

1878. Sea wall repaired; some fencing done, 78, 10.

1879. Care and preservation, 79, 14.

1880. History of fort, 80, 26.

1882. Care and preservation, 82, 20.

1884-86. History, and description of work, 84, 22; 86, 16.

1898. \$33.50 allotted for renewing coal bin and parapet steps; 11 10-inch guns with their carriages removed from the work, 98, 612.

1900. Description of fort; repairing retaining wall and parade, 1900, 814.

New Haven Harbor, Conn.—Fort Hale.

1866. Work begun about the close of the civil war. Work on embankments, sluiceway, setting 5 granite pintle blocks; 1 platform laid, 6 embrasures cut and revetted, and drawbridge built, 66, 8.

1867. Work completed, plant sold at auction, and fort placed in charge of a fort keeper, 67, 7.

1869. Making and hanging a gate at entrance to reservation, 69, 11.

1870. Repairs to sea wall, bridge, and road, 70, 17.

1871. Negotiations pending concerning the purchase of additional land, 71, 12.

1872. Fort dismantled, 72, 9.

1874. Fort abandoned, 74, 11.

1878. Project to modify the sea front for modern ordnance, and to make permanent bomb proofs; estimated cost, \$23,600, 78, 10.

1879. Care and preservation, 79, 14.

1880. History of fort, 80, 26.

1882. Importance of site, 82, 20.

Emplacements for two 12-inch guns on disappearing carriages.

1896. Plans prepared, 96, 13.

1897. \$132,000 allotted. Work begun by contract; excavation completed. 97, 609.

1898. Work delayed; time extended and battery completed ready for armament by June 30, 1898, 98, 612.

1899. \$1,500 allotted. Installation of electric light and power plant completed. \$2,500 allotted; one carriage received and mounted; two guns received. \$2,470 allotted for preservation and repair. 99, 747.

1900. \$2,500 allotted; guns mounted; battery completed and turned over to the artillery. \$2,000 allotted for waterproofing. \$2,500 allotted for alteration and repair; iron work painted. 1900, 814.

Two emplacements for 10-inch rifles, disappearing carriages, and a mining casemate.

1897. \$10,000 allotted for the emplacements, and \$11,000 allotted for one mining casemate, both to be built under one contract, 97, 609.

1898. \$99,000 allotted for emplacements, and \$2,750 allotted for moving and mounting guns. Work under contract begun; one carriage mounted and work about half done; extension of time granted. Summary of work. 98, 614.

1899. \$2,500 allotted for emplacements; work nearly completed. \$318.17 allotted for finishing the mounting of guns and carriages; completed. Mining casemate completed. \$2,004 allotted for a battery commander's range-finding station. \$310 allotted for preservation and repair. 99, 748.

1900. Battery commander's station finished and battery transferred to the artillery on Mar. 22. \$250 allotted for repairs. 1900, 817.

Emplacements for eight 12-inch B. L. mortars.

1897. \$110,000 allotted. Work begun, excavation finished, and concrete work in progress. \$2,004 allotted for a battery commander's range-finder station. 99, 750.

1900. Battery completed; armament to be mounted by the garrison; battery commander's station begun and completed; proposals for electric plant received. Summary of work. 1900, 818.

Temporary defenses at Bridgeport, New Haven, New London, and at Stonington.

1898. \$20,000 allotted. Four 10-inch S. B. Rodman guns mounted at Bridgeport, 6 at New Haven, and 1 at Stonington; 3 platforms for 15-inch S. B. guns prepared at New London, 98, 616.

1899. \$4,600 allotted. Batteries at the several places dismantled and guns and carriages stored; where the batteries were on private property the premises were restored where necessary, 99, 760.

Emplacements for two 10-inch B. L. rifles on disappearing carriages, model 1896.

1898. \$100,000 allotted. Work begun, and these emplacements nearly completed by June 25; résumé of work; \$3,000 allotted for transporting guns, 98, 619, 621.

1899. Guns and carriages received and mounted; electric light and power plant installed, and battery practically completed; search light temporarily installed, 99, 759.

1900. Platforms covered with as-

LONG ISLAND SOUND (Eastern entrance to) AND COAST OF CONNECTICUT—Continued.

phalt; slopes sodded, and minor work; battery transferred to the artillery May 12, 1900, 816.

Emplacement for a 4.7-inch R. F. gun.

1898. \$9,000 allotted. Work begun, gun and carriage mounted; work nearly finished, 98, 622.

1899. Work postponed in view of the probable necessity of raising the gun about 2 f. on account of change in the type of emplacements near by, 99, 760.

1900. Gun mounted, work completed and formally transferred to the artillery, Mar. 28, 1900, 1900, 820.

Emplacements for two 8-inch B. L. rifles on barrette carriages (15-inch S. B., converted).

1898. \$65,000 allotted. Work begun and platform nearly completed. Summary of work, 98, 622.

1899. \$12,100 allotted. Battery completed, except mounting guns. Work on sea wall, 99, 759.

1900. Interior floors concreted. Terreplein graded; guns and carriages not yet mounted, 1900, 822.

Two emplacements for 6-inch R. F. guns on disappearing carriages.

1899. \$50,000 allotted. Work begun; excavation in progress, 99, 750.

1900. Work practically completed, except consolidation of slopes and electric lighting. Carriages on hand, 1900, 819.

Two emplacements for 8-inch B. L. rifles on disappearing carriages, and two emplacements for 5-inch R. F. guns on balanced pillar mounts.

1899. \$75,000 allotted for emplacements. Work begun, dock completed, plant installed, and work carried up to ceiling level, 99, 751. 5-inch emplacements, \$11,600 allotted. Work begun and nearly completed; mounts not received, 99, 751.

1900. 2 carriages and 1 gun mounted, platforms asphalted, electric-light plant installed. 5-inch emplacements—2 carriages mounted; both batteries completed and ready to turn over to the artillery; \$1,650 allotted for repair and preservation, 1900, 821.

Emplacements for two 12-inch B. L. rifles on United States disappearing carriages, model 1897; two 10-inch B. L. rifles on U. S. disappearing carriages, model 1896; and three 6-inch R. F. guns on disappearing mounts.

1899. 12-inch and 10-inch emplace-

ments—\$220,000 allotted. Work begun, excavation completed, and concrete work in progress, 99, 752. 6-inch emplacements—\$78,000 allotted, work begun, excavation in progress, 99, 752.

1900. 10-inch emplacements completed and guns and carriages mounted; 12-inch emplacements well advanced and 6-inch emplacements expected to be completed by Oct. 1. Summary of work. \$2,000 allotted for preservation and repair, 1900, 823.

Emplacements for two 5-inch R. F. wire-wound guns, with parados.

1899. \$39,630 allotted. Work begun, concrete work nearly completed; mounts not received. \$2,195 allotted for repair to sea wall; work in progress, 99, 757.

1900. Plans changed, emplacements completed, except mounting guns, not yet received; parados finished and \$1,060 allotted for repairs to sea wall, etc., 1900, 822.

Emplacements for two 5-inch R. F. wire-wound guns.

1900. \$14,000 allotted. Battery begun and completed, except mounting armament, electric wiring, and sodding slopes, 1900, 822.

Preservation and repairs.

1899. \$2,180 allotted. Electric plant cared for; dismantled guns from temporary batteries disposed of; and minor work, 99, 758.

1900. \$800 allotted for supplies for seacoast defenses. Repairs made to the several electrical plants, 1900, 826.

Range and position finders station.

99, 749, 750; 1900, 818.

Sites.

1898. \$5,650 allotted for purchase of 3 tracts, about 60 acres. Condemnation proceedings instituted to acquire another site of about 225 acres, 98, 623.

1899. \$175,000 allotted. Site acquired, 99, 761.

1900. \$50,000 allotted for services in making abstracts of title to land already acquired, 1900, 826.

Submarine mines.

1898. \$29,000 allotted. Mines planted in Stonington, New London, and New Haven harbors, 98, 616. \$1,150 allotted for search light, 98, 621, 623.

1899. Mines unloaded as removed, and dynamite stored; orders received to complete the dismantling of the systems

LONG ISLAND SOUND (Eastern entrance to) AND COAST OF CONNECTICUT—Continued.

and final disposition of the material; work completed. \$300 allotted for electric light plant and operating search light; supplies purchased and machinery cared for, 99, 757, 760.

1900. \$500 allotted for storing and caring for mining material, and building a partition wall in mining casemate to separate battery from instrument room, 1900, 826.

LOBOS. (See *San Francisco, Cal.*)

MACOMB. (See *New Orleans, La., etc.*)

MACON. (See *North Carolina.*)

MAINE COAST.

Contracts.

1897. Two 12-inch emplacements complete, \$55,065.20. 97, 593.

1898. Portland cement, \$2.05 and \$2.22 per barrel. Sand, 94 cents and \$1.20 per c. y. Natural cement, 93 cents per barrel. 98, 588.

1899. Electric-lighting plant for 16 mortars, \$5,300. Sand, 94 cents per c. y. Portland cement, \$2.09 per barrel. Rosendale cement, 90 cents per barrel. 99, 681, 688.

1900. Portland "Vulcanite" cement, \$2.35 per barrel; "Atlas," \$2.20 and \$2.50 per barrel. Rosendale "Brooklyn Bridge" cement, \$1.10 and \$1.13½ per barrel. 1900, 757.

Engineering features.

Concrete, cost of. 94, 7; 97, 587.

Concrete, mixing and placing, description and cost. 1900, 757, 761, 762.

Materials, cost of. 94, 7; 97, 583, 587; 99, 698. 1900, 757.

Materials, methods of handling. 1900, 758.

Stone-crushing plant, description and cost. 1900, 757, 759, 765.

Waterproofing, methods of. 1900, 736, 738, 739, 763.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 4; 67, 4; 68, 7; 69, 7; 70, 12; 71, 7; 72, 4; 73, 5; 74, 6; 75, 6; 76, 7; 77, 5;

78, 7; 79, 9; 80, 19; 81, 17; 82, 12; 83, 8; 84, 13; 85, 7; 86, 7; 91, 6; 92, 8; 93, 5; 94, 6; 95, 6, 503; 96, 11, 469; 97, 11, 581; 98, 14, 583; 99, 16, 685; 1900, 13, 733.

BOARD OF ENGINEERS. Constituted, 1882, to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with. Report, 82, 414.

ENGINEERS IN CHARGE:

Maj. T. L. Casey, 1866-68.

Lt. Col. G. Thom, 1866-69.

Lt. Col. B. S. Alexander, 1867.

Maj. G. Weitzel, 1867.

Lt. Col. J. C. Duane, 1869-79.

Col. C. E. Blunt, 1879-86.

Maj. J. A. Smith, 1886.

Lt. Col. P. C. Hains, 1893-95.

Lt. Col. D. P. Heap, 1895-96.

Lt. Col. A. N. Damrell, 1896-97.

Maj. R. L. Hoxie, 1897-99.

Maj. S. W. Roesler, 1899-1900.

ASSISTANTS:

Lt. G. P. Howell, 1897-99.

Capt. C. Keller, 1899-1900.

Lt. T. H. Jackson, 1899-1900.

Forts and batteries.^a—Operations.

Portland Harbor, Me.—Fort Scammel.

1808. Original work—semicircular battery, with brick scarp and blockhouse

^a List of works as arranged under this head—

Portland Harbor.—Fort Scammel.

Portland Harbor.—New Fort Preble.

Penobscot River, narrows.—Fort Knox.

Kennebec River, mouth.—Fort Popham.

Portland Harbor.—Fort Gorges.

Portland Harbor.—Site No. 2.—Barbette battery.

Portland Harbor.—Barbette battery.

Portland Harbor.—Cow Island batteries.

Portland Harbor.—Great Hog Island batteries.

Portland Harbor.—Site 2.—Emplacements for 10-inch B. L. rifles.

Portland Harbor.—Site 1.—Mortar battery.

Portland Harbor.—Site 3.—Two emplacements for 12-inch guns.

Portland Harbor.—Site 2.—Emplacement for 6-inch R. F. gun.

Portland Harbor.—Site 3.—Eight emplacements for 8-inch guns.

Portland Harbor.—Site 3.—Temporary platforms for 8-inch rifles.

Bar Harbor.—Temporary defenses.

Portland Harbor.—Site 3.—Two emplacements for 15-pounder R. F. guns.

Portland Harbor.—Site 3.—Two emplacements for 6-inch R. F. guns.

Portland Harbor.—Site 3.—Mortar battery.

Portland Harbor.—Site 4.—Three emplacements for 15-pounder R. F. guns.

Portland Harbor.—Site 4.—Three emplacements for 12-inch rifles.

Portland Harbor.—Site 4.—Two emplacements for 10-inch rifles.

MAINE COAST—Continued.

in rear; a detached lunette northeast of it built, 80, 15.

1845. The work connected and inclosed with brick scarp and earthen parapet, 80, 15.

1862. Work on new plans begun, 80, 15.

1866. 6 casemates, second tier of east bastion, completed; the other 7 platforms ready for armament, 66, 5.

1867. 5 embrasures built in scarps of second tier of west bastion; 4 casemates for guns and 1 for flank howitzers completed in east bastion; 2 magazines in gorge nearly finished, 67, 5.

1868. Work on gorge wall, magazines, and excavation for foundations, 68, 9.

1869. Magazine traverse C built and drains completed; site for magazine traverse B excavated, 69, 9.

1870. Modification plans made. Care and preservation. 70, 13.

1871. \$50,000 appropriated. Old building demolished to make way for new work; 6 magazines built and covered with earth; work on great magazine in old work. 71, 8.

1872. \$42,500 appropriated. Stone piers in parade of west bastion built; parados built; communication through traverses of front 4 and the rock excavation for great magazine completed; minor work. 72, 5.

1873. \$50,000 appropriated. Great magazine and concrete arches over parade of east bastion built; work on bomb-proof of west bastion, embankments of great magazine, and traverses of main work; site prepared for main magazine of new work. 73, 6.

1874. \$30,000 appropriated. Concrete bomb-proof covering, breast-height walls, and concrete communications of east and west bastions completed; slopes of traverses and parados sodded; and all but one position made ready for platforms. 74, 7.

1875. \$20,000 appropriated. Parapet and bomb-proof embankments, gun platform and service magazines and stairway communication completed at east and west bastions; passages about the great magazine entrance completed; and minor work. 75, 7.

1876. Sallyport extension and second passage to extension in main work built in concrete; 2 gun platforms and all traverse and parados embankments of old part of main work completed, and parade graded, 76, 8.

1877-79. Care and preservation, 77, 6; 78, 8; 79, 9.

1885. Plans required revision, 85, 9.

1886. 6 magazines put in serviceable order; care and preservation, 86, 9.

Portland Harbor, Me.—New Fort Preble.

1808. Original work built, 80, 20.

1863. New work begun, 86, 9.

1866. Piling of the scarps finished, and bed of foundation of front 2 completed; minor work, 66, 5.

1867. Grillage and capping for foundation of scarps completed; 8 embrasures completed; rock excavation of scarps of old work, and masonry of fronts B and C commenced, 67, 5.

1868. The scarps of old work, and earthen parapet nearly finished; stairway from upper to lower parade completed; foundation for magazine traverse, south battery, completed; erecting piers; tearing down quarters; minor work, 68, 8.

1869. Magazine traverse, south battery, completed; excavation for new magazine in old inclosed work finished; parade partly filled in; minor work, 69, 8.

1870. Modification plans made; superior slopes of old work completed and sodded; terreplein partly graded; 250 c. y. concrete placed around magazine in old work; parade partly filled in, 70, 13.

1871. \$28,500 appropriated. Traverse magazine, and earthwork in gap between north battery and old redoubt finished; traverse magazine in south battery extension finished; minor work, 71, 8.

1872. \$42,500 appropriated. Great magazine and easterly traverse magazine built in old redoubt, and embankments built and sodded; breast-height wall of old redoubt built; second new traverse magazine in south battery finished; minor work, 72, 5.

1873. \$40,000 appropriated. Modification of old redoubt finished; last 6 traverse magazines of south battery built, two-thirds work completed; and north battery extension commenced, 73, 6.

1874. \$20,000 appropriated. Two permanent platforms in redoubt, one in north battery and one temporary wooden platform in south battery, made ready for guns; traverses and parapets of south battery completed; and concrete magazine, parados, bomb-proof, breast-height walls, part of embankment, and roadway of north battery completed, 74, 7.

1875. \$10,000 appropriated. 6 gun platforms, and breast-height walls and parapet of 5 bays in south battery completed; pintle bolts set for 4 additional gun platforms; 1 gun platform laid and all embankments completed in north battery, 75, 7.

MAINE COAST—Continued.

1876. 4 breast-height walls, 3 gun platforms built in south battery; parapet sodded; and north battery roadway completed, 76, 8.

1877-79. Care and preservation, 77, 6; 78, 7; 79, 10.

1885. Plans require revision, 85, 8.

Penobscot River, narrows of.—Fort Knox, Bucksport, Me.

1843. Work begun, 80, 19.

1866. Three-gun battery of the south-east place-of-arms nearly completed; covered communication with battery B finished; northeast demi-bastion, howitzer casemate, and defensive gallery built; and 3 positions for center pintle 15-inch guns in batteries A and B made ready for armament, 66, 4.

1867. North covered way, northeast demi-bastion, and defensive gallery, together with the closure wall and single caponniere of the north ditch, completed; minor work, 67, 4.

1868. Masonry and subdrainage of the storage casemates under the parade of main work completed; mounting guns on batteries A and B; finishing parapet and terrepleins of 15-inch guns; minor work, 68, 7.

1869. Exterior slope of the north covered way rebuilt to 8 f. below the interior crest; and northern and western exterior slopes of the northeast place-of-arms repaired, 69, 8.

1871-84. Care and preservation, 71, 7; 72, 4; 73, 5; 74, 7; 75, 6; 76, 7; 77, 5; 78, 7; 79, 9; 80, 19; 81, 17; 82, 12; 83, 8; 84, 13.

1885. 6 magazine floors renewed, outside buildings repaired; minor work, 85, 7.

1886. Parade graded, care and preservation, 86, 8.

1898. \$150 allotted. Project for change in position of old platforms and addition of modern guns; minor repairs of old works, 98, 583.

1899. \$800 allotted. Minor repairs of armament of old works, 99, 686.

1900. Storeroom repaired; minor repair of quarters, 1900, 733.

Kennebec River, mouth of.—Fort Pop- ham, Me.

1857. Casemated work, work begun, 80, 19.

1866. Scarps of the gun fronts and bastions brought to within 2 courses of the cordon line; all gun embrasures of the second tier of fire completed; second-story magazines nearly finished, and 5 second-tier casemates covered with bomb-proof arches, 66, 4.

1867. Scarps of the gun fronts and bastions brought to level of the cordon line; second-tier casemates along this front completed; minor work, 67, 4.

1868. Concreting arches of gun casemates 24 to 37, inclusive; laying concrete floors of 3 magazines on terreplein of water fronts; minor work, 68, 8.

1869. Board roof built over unfinished casemates; care and preservation, 69, 8.

1870-72. Care and preservation, 70, 13; 71, 8; 72, 5.

1873. Project for completion of fort, and construction of a contiguous exterior battery for 4 guns approved in 1872, 73, 5.

1874-86. Care and preservation, 74, 7; 75, 6; 76, 7; 77, 5; 78, 7; 79, 9; 80, 20; 81, 17; 82, 13; 83, 8; 84, 14; 85, 8; 86, 8.

1898. Work modified to meet modern requirements as to cover. No work under project. \$9,030 allotted; temporary wooden platforms for 15-inch guns built, and guns mounted; emplacement for 1 8-inch B. L. rifle on strengthened 15-inch S. B. gun finished and carriage mounted; minor work, 98, 584.

1899. \$2,300 allotted. Work on temporary platforms for 4 15-inch guns; emplacement for 8-inch rifle finished, 99, 686.

1900. \$1,500 allotted. Four 15-inch, S. B. guns dismounted and stored; platforms taken up, and ground leveled, 1900, 73.

Portland Harbor, Me.—Fort Gorges, Me. (Hog Island Ledge, Me.).

1857. Work begun, 80, 20.

1866. Modifying and constructing the gorge; preparing cut stone for stairway towers; minor work. The gun casemates about completed and ready for armament, 66, 4.

1867. Roof surfaces of the gorge completed, and same filled with earth to level of terreplein; quarters partly finished; drainage work; reenforcing with granite arches the scarp walls of the gorge magazines; minor work, 67, 4.

1868. Rubble foundations for two stairway towers completed; cut-stone masonry of towers 1, 3, and 4 partly completed; scarps of the magazines reenforced; 3 barbette center-pintle gun platforms built, and 2 magazine traverses on the gorge and 4 bomb-proof traverses built, 68, 8.

1869. 2 magazine traverses on the gorge, and bomb-proofs on fronts 1, 4, and 5 of barbette tier completed, and board roof built over them to protect them against the weather, 69, 8.

MAINE COAST—Continued.

1871. \$15,000 appropriated. Work resumed. The great magazine on front 1, central traverse magazine, new entrance to the easterly traverse magazine, and breast-height walls of front 1 nearly completed; earthwork on front 6 about finished. 71, 8.

1872. \$20,000 appropriated. Earthwork of gorge completed, and that of front 1 nearly completed; parados and covering of bomb-proofs begun. 72, 5.

1873. Parados on fronts 1, 3, 4, and 5 completed; some minor work, 73, 6.

1874. Quarters plastered, balcony ironwork completed, and stone and ironwork for barbette-gun platforms in progress, 74, 7.

1875. 7 gun-platform stones raised to the terreplein, 75, 6.

1876. Parade graded; balcony on parade wall built; parade gates iron plated and hung; completion of the flooring and finishing of all the quarters in the gorge, 76, 8.

1877-79. Care and preservation, 77, 6; 78, 7; 79, 9.

Portland Harbor, Me.—Site No. 2—Barbette battery (Portland Head).

1870-71. Project prepared by Board of Engineers; estimate, \$212,676, 70, 13; 71, 9.

1872. \$50,000 appropriated. Title to land yet to be perfected. 72, 6.

1873. Preparing for construction, 73, 6.

1874. Work begun, 1873; parapet embankment part filled in, and 4 concrete traverse magazines built, 74, 7.

1875. \$20,000 appropriated. Stone for 5 gun platforms prepared. 75, 7.

1876. Work on embankment of parapet and traverses of front 1; 3 breast-height walls, 6 gun platforms, and 2 traverse magazines built; minor work, 76, 8.

1877-79. Care and preservation, 77, 6; 78, 8; 79, 10.

Portland Harbor, Me.—Barbette battery (Little Hog Island, new work).

1870. Plans for an irregular hexagonal barbette battery; estimate, \$234,550, 70, 14.

Portland Harbor, Me.—Cow Island batteries.

1879. Plans for heaviest armor prepared by Board of Engineers, 79, 10.

1885. Plans require revision, 85, 9.

Portland Harbor, Me.—Great Hog Island batteries.

1879. Plans prepared by Board of Engineers for heaviest armor, 79, 11.

1884. Plans require revision, 84, 16.

Portland Harbor, Me.—Site No. 2—5 emplacements for 10-inch rifles (Portland Head).

1893. \$110,000 allotted. Work begun in April. 93, 5.

1894. 4,088 c. y. concrete placed in 2 emplacements, 94, 7.

1895. \$5,000 allotted. 2 emplacements completed, costing \$90,261.05; 12,450 c. y. concrete placed; foundation excavated for third emplacement. 95, 6, 503.

1896. Concrete work for third emplacement nearly completed, 96, 469.

1897. \$83,000 allotted. Work on battery C finished; 2 carriages and 4 guns mounted. 97, 584.

1898. \$21,000 allotted. Batteries B and C nearly completed; all guns mounted. 98, 588.

1899. \$200 allotted. Erection of ironwork. 99, 692.

1900. \$500 allotted. 6 observation stations erected; raising floors in magazines and passageways; ventilators placed in magazines and shell rooms, minor work. 1900, 736.

Portland Harbor, Me.—Site No. 1—Mortar battery (Fort Preble).

1897. \$125,000 allotted for battery for 16 12-inch mortars. Work begun Nov. 30, 1896; excavation well advanced. 97, 581.

1898. \$67,000 allotted. Excavation completed; platforms finished; base rings set and concrete work of 1 magazine nearly completed; 6,662 c. y. placed. 98, 585.

1899. \$14,050 allotted. All platforms completed, base rings set, carriages assembled, and 8 mortars mounted. 99, 687.

1900. \$19,000 allotted. All mortars mounted; work nearly completed. 1900, 735.

Portland Harbor, Me.—Site No. 3—2 emplacements for 12-inch guns (Great Diamond Island, Me).

1897. \$70,000 allotted. Battery to be built under contract. \$3,200 allotted for contingencies. Work begun in April, 1897. 97, 588.

1898. Excavation nearly finished; 2,908 c. y. concrete placed; progress unsatisfactory; contract annulled July 7, 1898, 98, 589.

1899. \$36,800 allotted. Work continued with hired labor; carriages and guns mounted; concreting, setting ironwork, and making drains. 99, 693.

1900. \$9,000 transferred from other works. Battery completed, except macadamizing the roadway and erection of hand railing. 1900, 739.

MAINE COAST—Continued.

Portland Harbor, Me.—Site No. 2—Emplacement for 6-inch R. F. gun (Portland Head).

1898. \$8,000 allotted. Work begun in May; platform built, ready for gun. 98, 588.

1899. Gun mounted and work completed. Cost, \$6,545.33. 99, 692.

Portland Harbor, Me.—Site No. 3—Eight emplacements for 8-inch guns on disappearing carriages (Great Diamond Island, Me.).

1898. \$150,000 allotted. Work begun in Mar. 98, 590.

1899. \$220,000 allotted. Battery A—3 carriages mounted; guns on hand; concreting nearly finished; some asphalt work. Battery B—both carriages mounted; concreting and asphaltting. Battery D—emplacement 1 nearly completed. 99, 694.

1900. \$17,000 allotted. Battery A—2,722 c. y. concrete placed; iron work placed; roadway graded. Battery B—concrete work; iron work and roadway completed; battery practically completed. Battery D—concrete work for 2 emplacements completed; iron work, platforms, and masonry walls in progress; minor work not finished. 1900, 738.

Portland Harbor, Me.—Site No. 3—Temporary platforms for two 8-inch converted rifles (Great Diamond Island, Me.).

1898. \$3,000 allotted. Platforms completed, with magazine, and guns mounted. 98, 590.

Bar Harbor, Me., temporary defense.

1898. \$6,000 allotted. Project for 2 8-inch converted rifles and 2 10-inch smoothbore guns mounted on temporary wooden platforms; consent of owners of sites secured; materials, guns, and carriages received in May. 98, 591.

1899. \$1,000 transferred from other allotments. Both 8-inch rifles mounted; 1 magazine finished; mounting 2 10-inch smoothbore guns and building magazines. Ordered to suspend work. 98, 685.

Portland Harbor, Me.—Site No. 3—2 emplacements for 15-pounder R. F. guns.

1899. \$10,000 allotted, 99, 693.

1900. Work begun; excavation nearly finished; location shifted 25 f. to the front, 1900, 740.

Portland Harbor, Me.—Site No. 3—2 emplacements for 6-inch R. F. guns.

1899. \$56,000 allotted, 99, 693.

1900. Work begun; excavation for

site completed, and foundation walls of rubble masonry of 1 emplacement laid, 1900, 740.

Portland Harbor, Me.—Site No. 3—Mortar battery.

1899. \$125,000 allotted for battery for 8 12-inch mortars; site cleared, and main drain nearly completed, 99, 693.

1900. Drainage completed; 1,301 c. y. concrete placed in traverses and magazine walls; 6,909 c. y. earth excavated; 7,671 c. y. ledge excavated, and 1,128 c. y. filling; 6 carriages received, 1900, 740.

Portland Harbor, Me.—Site No. 4—3 emplacements for 15-pounder R. F. guns.

1899. \$13,000 allotted, 99, 699.

1900. Work begun 1899; rock excavation completed; all floors constructed, drain pipes laid, and concreting commenced, 1900, 763.

Portland Harbor, Me.—Site No. 4—Three emplacements for 12-inch B. L. rifles on disappearing carriages.

1899. \$162,000 allotted. Site cleared for emplacements 3 and 4; 5,745 c. y. earth and 12,597 c. y. rock excavated. 99, 699, 700.

1900. \$17,000 allotted. Excavation for emplacements 3 and 4; drains and roadway completed; 1,982 c. y. concrete placed and drainpipe laid; waterproofing with Neuchatel-rock asphalt; excavation and drainage for emplacement 2 nearly completed. 1900, 762, 763.

Portland Harbor, Me.—Site No. 4—Two emplacements for 10-inch B. L. rifles on disappearing carriages.

1899. \$92,000 allotted. Excavation for emplacements and drains completed; 18,294 c. y. removed; artesian well under construction, 99, 699.

1900. \$26,000 allotted. 2,435 c. y. concrete placed and all floors completed. 1900, 763.

Preservation and repair of fortifications.

1898. \$50 allotted for Fort Gorges; repairing scarp wall, 98, 584. Minor work at Fort Preble, 98, 585. \$550 allotted for mounting 2 15-inch smoothbore guns at Fort Scammel. 98, 587.

1899. Minor repairs at Fort Preble, 99, 687. \$600 allotted for minor repairs of old works, 99, 702. \$750 allotted for minor repairs at mining casemate. 99, 703.

1900. \$800 allotted for repairing quarters at Fort Gorges, 99, 734. \$1,400 allotted for site 1; floors in magazines and

MAINE COAST—Continued.

shell rooms repaired, 1900, 735. \$12,000 allotted for repairing floors, waterproofing experiment, and minor work at site 2, 1900, 736. \$700 allotted for torpedo material at site 4. 1900, 768.

Range and position finders.

1899. \$9,000 allotted. Drawings made. 99, 702.

1900. 6 observation stations erected, 1900, 736.

Sites.**Cushings Island, Me.**

Site, about 33.4 acres, acquired by condemnation proceedings, \$112,423.60, 94, 13.

Battery for sixteen 12-inch mortars.

Site purchased for \$13,202.50, 97, 12.

Submarine mines.

1897. 3 casemates proposed, with estimate of cost, 87, 11.

1891. Project for additional casemate, 91, 6.

1892. 1 casemate nearly completed, 92, 8.

1893. 1 casemate completed, cost \$8,979.75; work on 2 more begun, 93, 5.

1894. Work on 2 casemates, 94, 7.

1895. 2 casemates completed in Oct., 1894, cost \$17,968.92, 95, 8.

1898. Cable storage tank at Fort Preble completed, cost \$2,206.53. \$4,500 allotted, 1897, for torpedo storehouse at Fort Gorges; nearly completed. 98, 584, 585. \$23,300 allotted for torpedo defense—mines placed in the three channels leading into Portland Harbor, and also in the Kennebec and Penobscot rivers; 6 casemates equipped. 98, 592.

1899. \$350 allotted. Small storehouse built; minor work, 99, 686, 702. \$9,000 allotted—mines removed from harbor and rivers, cleaned and stored (explosives utilized in connection with rock excavation for fortifications), 99, 708. \$1,200 allotted for searchlight supplies; no funds necessary, 99, 709.

1900. Torpedo material overhauled and cleaned, 1900, 768.

Supplies for coast defenses.

1900. \$600 allotted for filling requisitions by post commanders for material to be supplied by the Engineer Department, 1900, 768.

MARION. (See *Florida*.)**MASON.** (See *San Francisco, Cal.*)**MASSACHUSETTS AND RHODE ISLAND (southeast coast of) AT NEW BEDFORD, MASS., AND NEWPORT, R. I.****Contracts.**

1897. Sand, \$1.25 per c. y.; small stone, \$1.81 per c. y.; Rosendale cement, 85 cents per barrel; Portland cement, \$2.12 per barrel, 97, 604. Three 10-inch emplacements, \$56,967 for two, 97, 606.

1899. Rosendale cement, 68 cents per barrel; small stones, \$1.80 per c. y.; sand, \$1.35 per c. y.; Portland cement, \$2.15 per barrel, 99, 737.

Engineering features.

Asphalt, placing, 1900, 809.

Cement test, 96, 471.

Materials and work, cost of, 99, 726, 733, 735; 1900, 803, 805, 809, 811.

Mining casemate, 96, 471.

Waterproofing, 1900, 795, 799, 809.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 6; 67, 6; 68, 10; 69, 10; 70, 15; 71, 11; 72, 8; 73, 8; 74, 9; 75, 9; 76, 10; 76, 7; 77, 9; 78, 9; 79, 13; 80, 24; 81, 22; 82, 17; 83, 13; 84, 19; 85, 12, 423; 86, 14; 93, 6; 94, 7; 95, 7, 503; 96, 12, 471; 97, 12, 603; 98, 16, 601; 99, 18, 724; 1900, 16, 791.

BOARD OF ENGINEERS:

Constituted, 1882, to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with. Report, 82, 416.

Report, 1887, 87, 11.

ENGINEERS IN CHARGE:

Capt. H. M. Robert, 1865.

Maj. G. H. Mendell, 1866-67.

Capt. S. M. Mansfield, 1866.

Maj. D. C. Houston, 1866-70.

Capt. J. A. Smith, 1867-69.

Lt. Col. G. K. Warren, 1870-83.

Capt. A. H. Holgate, 1870.

Maj. J. W. Barlow, 1883.

Lt. Col. G. H. Elliot, 1883-86.

Capt. W. H. Bixby, 1893-95.

Lt. W. W. Harts, 1895-96.

Maj. D. W. Lockwood, 1896-1900.

ASSISTANTS:

Lt. W. H. Harts, 1893-95.

Capt. C. H. McKinstry, 1896-98.

Lt. W. B. Ladue, 1898-99.

Lt. W. J. Barden, 1898.

Capt. Harding, 1898-99.

Lt. R. P. Johnson, 1898-1900.

MASSACHUSETTS AND RHODE ISLAND, ETC.—Continued.

Forts and batteries.^a—Operations.

Newport Harbor, R. I.—Fort Adams (Narragansett Bay).

1824. Work begun, 80, 24.

1866. Work on refacing 2 embrasures; repairs to slopes; replacing granite wall above the coping with earthen parapet; building 2 traverse magazines; and laying platforms for 2 15-inch and 2 10-inch guns, 66, 7.

1867. Relaying traverse circles; 4 additional platforms laid; 2 service magazines built. Work begun on exterior batteries to adapt them to an armament of 15-inch and heavy rifled guns; minor work. 67, 7.

1868. Wharf repaired, new postern gates built; minor repairs to drains, coping, sidewalks, casemates, arches, etc., 66, 11.

1869. General repairs of masonry, sea wall, wharf and quarters, 69, 11.

1870. Modification plans approved for an exterior barbette battery for heavy guns; estimate, \$132,000. Work on latrines, repairing wharf; minor work. 70, 16.

1871. Repairing wharf, quarters, southeast glacis; minor work, 71, 11.

1872. \$85,000 appropriated. Repairs of roads, etc. Preparing for modification work. 72, 8.

1873. \$65,000 appropriated. Work begun on modification. Work on parapet, roads, and quarters. 73, 8.

1874. \$20,000 appropriated. Completion of concrete for 6 magazines—traverses. Work on parapet terreplein, wharf; drainage system completed. 74, 10.

1875. \$15,000 appropriated. Foundations for platforms for 6 heavy guns laid, and earth of 2 traverses, with bonnets, completed; work on and repairs of slopes. 75, 9.

1876. Four platforms set; grading slopes; drainage work; preservation and repairs, 76, 10.

1877. Care and preservation, 77, 8.

1878. Fence built, 78, 10.

1882. \$10,000 allotted in 1881 for repairs of wharf; \$1,000 allotted for waterproofing casemate; rebuilding bridges, and repair of buildings, 82, 18.

1883. Waterproofing work; casemates ventilated by removing the brick cheeks of the embrasures, and loopholes; repair of buildings and wharf, 83, 14.

1884. Preservation and repair—finishing wharfs, repairing facings of 6 embrasures, sea wall, walks, etc., 84, 20.

1885. Work on waterproofing, sea wall, repairing facings of embrasures, drainage, and minor work, 85, 14.

1886. Ironwork of 4 front pintle platforms for 15-inch or heavy rifled guns completed; flooring of 2 magazines; work on drainage, sea walls, breast-height walls, and waterproofing, 86, 14.

New Bedford Harbor, Mass.—Clarks Point (Fort).

1857. Work begun for casemated fort, 80, 24.

1866. Work on scarp of water fronts, parade wall, square towers, excavation; minor work, 66, 6.

1867. 3 casemates made ready for guns; masonry of 5 magazines completed, and 3 magazines made ready for powder. Work on scarp and parade walls. 67, 6.

1868. Scarp and parade walls completed, work on foundations for breast-height wall, and gun platforms; mastic covering of roofs, 68, 10.

1869. Completion of first and second tiers, except quarters; mastic covering of roof surfaces and magazines, 3 barbette magazines, breast-height wall, parapet, and terreplein of gorge and 2 rectangular stairs, 69, 10.

1870. This casemated work completed except its barbette battery over the casemates. Board of Engineers recommended that nothing further be done than to preserve it from deterioration,

^a List of works arranged under this head—

Newport Harbor.—Fort Adams.

New Bedford Harbor.—Clarks Point.

Narragansett Bay.—Dutch Island.

New Bedford Harbor.—Fort Phoenix.

Conanicut Island.—Dumplings Battery.

Newport Harbor.—Fort Green.

Narragansett Bay.—Emplacements for three 10-inch guns on disappearing carriages.

Narragansett Bay.—Mortar battery for sixteen 12-inch mortars.

New Bedford Harbor.—Mounting 8-inch converted rifles.

New Bedford Harbor.—Two emplacements for 8-inch guns.

Narragansett Bay.—Two emplacements for 10-inch rifles.

Narragansett Bay.—Two emplacements for 4.7-inch R. F. guns.

Narragansett Bay.—One emplacement for 8-inch B. L. rifle.

Narragansett Bay.—Mortar battery for eight 12-inch mortars.

Narragansett Bay.—One emplacement for 6-inch R. F. gun.

Narragansett Bay.—Two emplacements for 12-inch rifles.

New Bedford Harbor.—Four emplacements for 5-inch R. F. guns.

Narragansett Bay.—Two emplacements for 3-inch 15-pounder guns.

Narragansett Bay.—Two 15-pounder guns.

MASSACHUSETTS AND RHODE ISLAND, ETC.—Continued.

and that an earthen barbette battery for 26 15-inch S. B. or equivalent rifled guns be erected on the hill in rear of the fort. Repair and preservation. 70, 15.

1874. Minor repair of buildings, 74, 9.

1875. Plans for heavy gun batteries completed; estimate, \$181,344.60. Minor repairs of plant. 75, 9.

1876-79. Preservation and repair, 76, 10; 77, 7; 78, 9; 79, 13.

1884. Painting ironwork, mowing slopes, repairing fences, buildings, etc., 84, 20.

1885. Storing engineer property; temporary doors provided for magazines, 85, 13.

1886. Repairs of buildings, magazine doors, and bridges, 86, 14.

Dutch Island, Narragansett Bay, R. I. (western end).

1863. Work begun on temporary defenses, 80, 24.

1866. Site purchased, temporary work; upper and lower battery completed during year. Project being prepared for permanent defenses. 66, 7.

1867. Work begun on permanent defenses in March—altering earthen battery built during the war. Minor work and repairs. 67, 7.

1868. Work on altering upper battery to adapt it to an armament of 15-inch guns, on permanent wharf, and removing buildings, 68, 11.

1869. Same as previous year, and general repairs to wharf, drains, and buildings, 69, 11.

1870. Project for 3 detached barbette batteries for 40 15-inch S. B. or equivalent rifle guns; estimate, \$208,477. Work on buildings, wharf, etc. 70, 16.

1871. \$121,998 reappropriated. Work begun, general repair of plant. 71, 12.

1872. New plans approved. Work begun, foundations of 2 service magazines completed, and 2 others begun. Minor work. 72, 9.

1873. \$40,000 appropriated. Concrete work of 4 magazines. 73, 9.

1874. \$20,000 appropriated. Traverses of 4 magazines covered in with sand and sodded; parapet, connecting them, completed for a breast height of 7 ft.; work on water supply, drainage system, and on minor repairs of plant. 74, 10.

1875. \$20,000 appropriated. Work on water supply, drainage system, grading ground in front and rear of battery, and seeding same; foundations of 2 platforms laid, and 2 platforms received. 75, 10.

1876. Platforms for 4 guns laid, breast-height wall completed; work on

parapet; and preservation and repair, 76, 11.

1877-79. Care and preservation, 77, 8; 78, 10; 79, 13.

1884. Preservation and repair—painting ironwork; renewing shot beds and skiddings for guns; repairs to ventilating chimneys of magazines, building, and dock, etc., 84, 21.

1885. Preservation and repairs—repairs of quarters, slopes, 85, 14.

1886. Work on ironwork of 1 center pintle and 4 front pintle 15-inch or heavy rifled guns, and fitting up 2 service magazines by placing floors and doors; minor repairs of wharves, buildings, etc., 86, 15.

New Bedford Harbor, Mass.—Fort Phoenix.

1866. Magazine anteroom floored, and 2 doors hung, 66, 7.

Conanicut Island, R. I.—Dumpling's Battery.

1870. On site of old Dumpling's tower, project for a barbette battery for 10 15-inch S. B. or equivalent rifle guns on site of the ruins of an old casemated tower, built about the close of the last century on Conanicut Island opposite Fort Adams. Estimate, \$100,000. 70, 16; 74, 10.

Newport Harbor, R. I.—Fort Green, R. I. (Narragansett Bay).

1885. Resolution of the Senate, Jan. 9, 1885, requested information concerning the possession and occupancy of Fort Green; report submitted by officer in charge, recommending transfer of the land to the city of Newport for use as a public park. History. 85, 15, 423.

Narragansett Bay, R. I.—Emplacements for three 10-inch guns on disappearing carriages.

1897. \$99,400 allotted. Work begun for construction, by contract, of 3 emplacements; excavating and concreting in progress. 97, 605.

1898. \$12,000 allotted. Two old magazines removed by contract; work of mounting guns and carriages completed; installing electric-lighting plant, cost of labor and materials. 98, 607.

1899. Storage battery installed. Battery turned over to the artillery. 99, 737.

1900. New locking devices to ammunition lifts installed; dampness in magazines corrected, 1900, 807.

Narragansett Bay, R. I.—Mortar battery for sixteen 12-inch mortars.

1897. \$125,500 allotted. Work begun. Necessary excavation done by con-

MASSACHUSETTS AND RHODE ISLAND, ETC.—Continued.

tract. Work on platforms and walls in progress. 97, 605.

1898. \$10,000 allotted. Battery completed, guns and carriages mounted, storage battery installed, and turned over to the artillery on June 6, 1898. 98, 603.

1899. \$240 allotted for repairs of slopes, parapet, and concrete floors, 99, 730.

1900. Building shelter for projectiles, 1900, 798.

New Bedford Harbor.—Mounting 8-inch converted rifles.

1898. \$1,800 allotted. Work begun. 98, 602.

New Bedford Harbor.—Two emplacements for 8-inch guns on disappearing carriages.

1898. \$50,000 allotted. Work begun, excavation completed, and platforms ready for guns. 98, 602.

1899. \$53,500 allotted. Guns mounted and work completed, except electric lighting. 99, 724, 725.

1900. Repairs of slopes. Battery transferred to the artillery. 1900, 791.

Narragansett Bay, R. I.—Two emplacements for 10-inch rifles, disappearing carriages.

1898. \$74,000 allotted. Work begun, 1 gun and carriage mounted. 98, 604.

1899. \$18,620 allotted. Guns mounted and tested, battery completed except electric-lighting, battery turned over to the artillery. 99, 731.

Narragansett Bay, R. I.—Two emplacements for 4.7-inch r. f. guns on pedestal mounts.

1898. \$12,000 allotted. Work begun, and platforms ready to receive guns by May 23. 98, 605.

1899. \$5,000 allotted. Guns mounted and tested, battery completed and transferred to the artillery. 99, 733.

Narragansett Bay, R. I.—One emplacement for 8-inch B. L. rifle.

1898. \$3,000 allotted. Work begun and completed for making the necessary changes in the 15-inch carriage for the 8-inch rifle (B. L.), carriage ready for mounting rifle. 98, 606.

Narragansett Bay, R. I.—Mortar battery for eight 12-inch mortars.

1898. \$2,500 allotted. Survey of site made; plans and estimates being prepared. 98, 608.

1899. \$125,000 allotted. Work begun and about 40 per cent completed. 99, 737.

1900. \$15,900 allotted; work about 95 per cent completed. 1900, 808.

Narragansett Bay, R. I.—One emplacement for 6-inch R. F. gun.

1898. \$8,000 allotted. Work done by contract completed, and gun mounted; cost of labor and materials. 98, 608.

1899. \$250 allotted. Minor repairs of parapet, etc. 99, 739.

Narragansett Bay, R. I.—Two emplacements for 12-inch rifles, nondisappearing carriages.

1898. \$40,000 allotted. Work begun on excavation. 98, 609.

1899. \$93,708.44 allotted. Guns mounted, and battery completed except installation of electric plant, some embankment and sodding work, and minor details. 99, 742.

1900. General repairs. 1900, 802.

New Bedford Harbor, Mass.—Four emplacements for 5-inch R. F. guns.

1899. \$13,300 allotted. Plans and estimates approved for pedestal mounts. 99, 729.

1900. \$4,200 allotted. Work begun, excavation completed, and concrete work in progress. 1900, 792.

Narragansett Bay, R. I.—Two emplacements for 3-inch 15-pounder R. F. guns.

1899. \$10,000 allotted. Plans and estimates approved. 99, 740.

1900. Work begun. Two old S. B. 15-inch guns dismounted and, with their carriages, removed from site of work; excavation in progress. 1900, 812.

Narragansett Bay, R. I. Two 15-pounder R. F. guns.

1899. \$11,065 allotted. Work begun, excavation completed; concrete completed, except loading platforms. 99, 741.

1900. Guns and carriages not received, 1900, 804.

Preservation and repair of fortifications.

1898. \$7,700 allotted. Rebuilding breast-height wall; parapet work completed; repairing brick walk, break in sea-wall, and platforms of 8-in. converted rifles. 98, 606.

1899. \$400 allotted for New Bedford Harbor, 99, 729. Narragansett Bay—\$6,495.50 allotted. Repairing sea-wall and parade wall, and buildings; minor repairs, 99, 735. \$1,879.82 allotted for repairing bracket hangers, and for minor work. 99, 740.

1900. \$420 allotted for minor repairs, \$600 allotted for storing mining material at New Bedford Harbor, 1900, 798.

MASSACHUSETTS AND RHODE ISLAND, ETC.—Continued.

\$1,165 allotted for correcting dampness in magazine, care of mining material, wiring mining casemates, repairs of quarters, repairing ventilators and culvert, and minor work, 1900, 800. \$975 allotted for correcting dampness in dynamo room, 1900, 805. \$1,730 allotted for correcting dampness in 10-in. battery. 1900, 813.

Range and position finders.

1898. \$2,300 allotted for a tower for temporary installation of a Lewis range finder at Narragansett Bay, R. I.; completed and sheathed with 12 in. of timber and steel plates, 98, 604.

1899. \$90 allotted for installation of 2 range finders; \$2,420 allotted for constructing a battery commander's station, 99, 736. \$30 allotted for installing 2 range finders; \$4,950 for constructing a battery commander's station. 99, 740.

1900. \$25 allotted for installing a range finder, location not definitely decided upon, 1900, 797. \$935 allotted for revised work on battery commander's station; work begun and completed, and turned over to the artillery, 1900, 799. Battery commander's station completed, and turned over to the garrison; total cost, \$4,044.33. 1900, 810.

Sites.**Fort Adams—Narragansett Bay:**

Suit of ejectment begun against occupant of three-fourths acre; judgment rendered in favor of defendant; suit begun to determine and fix the U. S. boundaries at this disputed locality, 95, 13, 503. Description of sites acquired by condemnation proceedings, 98, 611. Condemnation proceedings instituted against owners of land needed for fortification

purposes, 99, 746. A total of \$261,555.94 allotted for purchase and survey of land; 32 acres of one site and 31.67 acres of another site acquired by condemnation proceedings. 1900, 806-807.

Submarine mines.

1892. Plans and estimates for 2 mining casemates for defense of Narragansett Bay in preparation, 92, 8.

1893. Work of excavation begun on 1 casemate at Narragansett Bay, 93, 6.

1894. Completion of 1 casemate and work on the other at Narragansett Bay, 94, 7.

1898. \$15,000 allotted for planting mines in New Bedford Harbor, 98, 602. Cable tank completed at Narragansett Bay. \$11,000 allotted for planting mines in Narragansett Bay. 98, 610.

1899. \$13,500 allotted for mining casemate at New Bedford Harbor, 99, 729. \$3,400 allotted for cable tank at New Bedford Harbor; excavation nearly finished, 99, 729. Mines not planted in New Bedford Harbor, as enough material and supplies had not been received before operations were suspended, 99, 730. Narragansett Bay—\$1,000 allotted for caring for and storing mining material. \$8,700 allotted for a torpedo storehouse, 99, 736. \$11,080 allotted for a mining casemate that would be free from dampness, 99, 740. \$10,000 allotted for planting and removing and caring for torpedo material. 99, 745.

1900. Work on mining casemate at New Bedford Harbor, 1900, 794. Cable tank completed, 1900, 794. \$300 allotted for readjusting the discharge pipe leading from the cable tank; work completed, 1900, 800. Mining casemate nearly completed. 1900, 811.

MASTIC WORKS. (See *U. S. Mastic works on Governors Island, New York Harbor.*)

McCLARY. (See *Portsmouth Harbor, N. H.*)

McHENRY. (See *Baltimore, Md.*)

McRIE. (See *Pensacola, Fla.*)

MIAMI, FLA. (See *Florida, East; and Key West.*)

MIFFLIN, PA. (See *Delaware River.*)

MISSISSIPPI SOUND. (See *below.*)

MOBILE AND MISSISSIPPI SOUND.**Contracts.**

1897. Sea wall—Fascine mattress in place, \$1.40 and \$3.20 per s. y., 97, 723.

1899. Gravel, 10,000 c. y., \$2 per

c. y.; Atlas Portland cement, 12,000 barrels, \$2.17 per barrel, 99, 926.

1900. Sea wall—stone in place, \$3.25 per c. y.; fascine mattress in place, 75 cents per s. y., 1900, 949.

MOBILE AND MISSISSIPPI SOUND—Continued.

Engineering features.

Air spaces, 1900, 951.
Concrete ingredients, 1900, 944.
Concrete mixing, 98, 741.
Materials, itemized cost, 97, 726.
Mines, firing by judgment, 98, 744.
Mixer, concrete, 1900, 950.
Plant, concrete, 99, 925.
Electric light, 99, 928; 1900, 944.
Itemized cost, 97, 726.
Sea wall, description of, 1900, 948.
Waterproofing, 98, 740; 99, 924, 928; 1900, 944, 946, 947, 950.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 16; 67, 13; 68, 18; 69, 17; 70, 25; 71, 21; 72, 19; 73, 21; 74, 25; 75, 24; 76, 25; 77, 21; 78, 24; 79, 28; 80, 47; 81, 48; 82, 46; 83, 42; 84, 48; 85, 41; 86, 41; 95, 11; 96, 18, 519; 97, 18, 722; 98, 28, 737; 99, 30, 924; 1900, 27, 943.

BOARD OF ENGINEERS. Constituted, 1882, to consider and report upon the condition of fortifications and what number, if any, could be dispensed with, 82, 425.

ENGINEERS IN CHARGE:

Capt. J. C. Palfrey, 1866.
Capt. W. E. Merrill, 1866.
Maj. M. D. McAlester, 1866-68.
Maj. F. E. Prime, 1868-69.
Capt. A. N. Damrell, 1869-70.
Maj. C. B. Reese, 1870-71.
Col. J. H. Simpson, 1871-73.
Lt. Col. W. F. Reynolds, 1873.
Lt. Col. A. N. Damrell, 1873-96.
Lt. E. E. Winslow, 1896.
Maj. W. T. Russell, 1896-1900. Report, 96, 521.

ASSISTANTS:

Lt. E. E. Winslow, 1895-96.
Lt. H. Burgess, 1896-97.
Lt. J. B. Cavanaugh, 1897-1900.

Forts and Batteries. a—Operations.

Mobile Bay, eastern entrance to—Fort Morgan, Mobile Point, Ala.

1819. Work begun, 80, 47.
1823. Fort completed, 80, 47.
1866. Shot holes in counterscarp repaired, and those in the scarp made ready for masonry, 66, 16.
1867. General repairs to parapet, parade walls, and terrepleins of all the front. Work on a breakwater. 67, 14.

^a List of works as arranged under this head:

Mobile Bay, eastern entrance.—Fort Morgan.
Mobile, entrance.—Fort Gaines.
Mississippi coast.—Fort on Ship Island.
Mobile, Ala.—Site 1—Battery for 8-inch guns.
Mobile and Mississippi Sound.—Site 1—Emplacement for 4.7 inch R. F. gun.
Mobile, Ala.—Site 1—Battery for 2 12-inch rifles.
Mobile, Ala.—Site 2—Battery for 2 8-inch rifles.
Mobile and Mississippi Sound.—Site 1—Mortar battery for 8 12-inch mortars.
Mobile and Mississippi Sound.—Site 1—Emplacements for 2 15-pounder R. F. guns.
Mobile and Mississippi Sound.—Site 2—Emplacement for 2 6-inch R. F. guns.

1868. Repair of buildings, breakwater, drains, 68, 18.

1869. Repair of wharf, breakwater, and slopes, 69, 17.

1870. Modification plans being prepared. Minor repairs made. 70, 25.

1871. General repairs, 71, 22.

1872. Wharf rebuilt, iron screw piles used instead of wooden ones, and the stone, brick, and wood pier leading to it renewed, 72, 19.

1873. Engineer property removed from casemates and stored in buildings outside the fort to make room for ordnance stores and ammunition. 12 fender piles were copped and placed around head of wharf; work begun on sea wall. 73, 21.

1874. Work on sea wall, repair of slopes and ditches, 10 4-inch front pintle masonry platforms, with low traverse stones, and 2 of same with high traverse stones built. Estimated cost of proposed modifications for exterior batteries, with positions for 37 guns of the largest caliber, and for emplacements for mortars in the old work, \$370,000. 74, 25.

1875. \$25,000 appropriated. Slight repairs to sea wall and wharf. 75, 24.

1876. Modification work begun, quarters, buildings, and R. R. track repaired. 2,687 f. new R. R. track and 4 cars built; parapet, parapet, breast height wall and foundation for the gun platform for gun position No. 1, service magazines for the battery, breast height wall, foundation for gun platform, and part of parapet for gun position No. 2, completed. 76, 25.

1877. General repairs to slopes, drains, etc. Work begun on extension to sea wall. 77, 21.

1878. Sea wall extension, 750 f. long, completed. Repairs to buildings; 2 cisterns, each with a capacity of 7,300 gallons, built. 78, 24.

1879. Repairs to fence, wharf, slopes, and ditches, 79, 28.

1880. History. Work on sea wall. 80, 48; 81, 48; 82, 46; 83, 42.

1886. Shutters fitted to embrasures; ditches, drains, gutters, etc., cleaned, 86, 41.

Mobile Bay, entrance to.—Fort Gaines, Dauphin Island.

1848. Work begun, 80, 48.

1866. Fort in serviceable condition, 66, 16.

MOBILE AND MISSISSIPPI SOUND—Continued.

1868. Repairs to wharf, buildings; earth cover of scarp of southwest bastion removed and the material embanked in glacis; 2 wing dams built, **68**, 18.

1869. Repairs to wharf, plank walks, buildings; slopes and ditches graded; 2 jetties and a breakwater built, **69**, 17.

1870. Modification plans being prepared, **70**, 25.

1871-72. Care and preservation, **71**, 22; **72**, 19.

1873. Drains cleaned and repaired, and work on jetties, **73**, 21.

1874. Work on jetties, 4 front and 4 center pintle platforms removed, and 4 carriages and chassis removed from beach. Estimate, modifications, \$83,000. **74**, 25.

1875. Care and preservation, **75**, 24; **76**, 26.

1877. Repairs to buildings; a brush apron and jetty built, **77**, 21.

1878. Care and preservation, **78**, 24; **79**, 29.

1880-86. History; care, and preservation, **80**, 48; **83**, 43; **84**, 48; **85**, 41; **86**, 41.

Mississippi Coast.—Fort on Ship Island.

1862. Work begun, **80**, 48.

1866. Work begun in July with turning the arches supporting the parapets; completion of the breast height wall, culvert arches, and mastic covering. Terreplein graded, **66**, 16.

1867. Work completed ready for armament, **67**, 14.

1868. Repairs to slopes, **68**, 18.

1870. Modification plans being prepared, **70**, 25.

1871-73. Care and preservation, **71**, 22; **72**, 19; **73**, 21.

1874. Temporary bridge erected across drawbridge well; 2 15-inch Rodman guns and 2 100-pounder Parrott guns mounted by the Ordnance Department, **74**, 25.

1875. Care and preservation, **75**, 24.

1876. Stone flagging completed, repairs to quarters, **76**, 26.

1877. General repair of buildings, **77**, 21.

1878. Care and preservation, **78**, 25; **79**, 29.

1880-81. History; care and preservation, **80**, 49; **81**, 49.

1882-84. Care and preservation, and work on jetties, **82**, 47; **83**, 43; **84**, 48.

1885. Care and preservation, **85**, 42.

1886. 14 shot beds built, magazine floors cemented over, and shutters repaired, **86**, 42.

Mobile, Ala.—Site 1.—Battery for 8-inch guns.

1895. \$50,000 allotted. Work begun. **95**, 11.

1896. \$9,000 allotted. 6,800 c. y. concrete placed. Itemized cost of work. \$5,000 allotted for constructing platform; partly finished. Itemized cost. **96**, 520.

1897. \$118,500 allotted. Emplacements 1 and 2 ready for carriages, model of 1894; and emplacements 3 and 4 for carriage, model of 1896. First emplacement completed; partial construction of the 3 others. Summary and itemized cost of each emplacement and platform. **97**, 724.

1898. \$16,500 allotted. All concrete placed, trolley systems and ammunition hoists, etc., installed, all guns and carriages mounted and the battery practically completed and transferred to the artillery. \$14,700 allotted to complete the battery, install the electric plant, and repair and strengthen wharf; work in progress. **98**, 738.

1899. \$500 allotted. 3,517 c. y. sand placed in parapet, 4,690 s. y. sod placed, electric plant installed, magazines waterproofed, and a carpenter shop built. **99**, 924.

Site 1.—Emplacement for 4.7-inch R. F. gun.

1898. \$15,000 allotted. Work begun on 2 emplacements, platform built and guns and carriages mounted. Concrete work of parapet nearly completed. Magazines waterproofed with 4 layers of asphaltic cement and felt. **98**, 740.

1899. Battery completed in all its details and transferred to the artillery. Summary of work. **99**, 927.

Mobile, Ala.—Site 1.—Battery for two 12-inch rifles on disappearing carriages.

1898. \$125,000 allotted. Work begun, wharf completed, necessary buildings and plant erected. Platforms completed ready for guns. **98**, 741.

1899. \$51,500 allotted. Battery completed, except minor details. 2 carriages received; mounting them in progress. Summary of work. **99**, 927.

1900. Old armament removed from parapet of old fort and parked; electric plant installed. Corrections made by the Ordnance Department of carriages. Minor work completed and battery turned over to the artillery on June 4, 1900. Summary of work. **1900**, 945.

Mobile, Ala.—Site 2.—Battery for two 8-inch rifles on 15-inch Rodman carriages.

1898. \$12,000 allotted. Creosoted pile wharf built, and construction materials purchased. **98**, 742.

1899. \$8,000 allotted. Concrete work begun and 1,017 c. y. placed, completing same. Carriages and guns received and

MOBILE AND MISSISSIPPI SOUND—Continued.

mounted. Battery completed, except raising the parapet. Summary of work. 99, 931.

Site 1.—Mortar battery for eight 12-inch B. L. mortars.

1899. \$140,000 allotted. Work begun, plant installed, 2,579 c. y. sand placed in parade; 3,278 c. y. concrete, including 591 s. y. granolithic, placed. Anchor bolts set and platforms completed. 8 carriages received. 99, 926.

1900. 7,831 c. y. concrete placed, completing same; waterproofing battery; electric plant installed; mounting carriages in progress. Summary of work. 1900, 943.

Site 1.—Emplacements for two 15-pounder R. F. guns.

1899. \$9,000 allotted. Work begun. 99, 929.

1900. 549 c. y. concrete placed, 2,188 c. y. sand placed in parapet, and battery completed and turned over to the artillery on June 4, 1900. Summary of work. 1900, 946.

Site 2.—Emplacement for two 6-inch R. F. guns on disappearing carriages.

1899. \$55,000 allotted. Materials being purchased. 99, 932.

1900. \$15,000 allotted. Work begun July 17, 1899. 4,300 c. y. concrete placed, completing same except steps and walks in rear of battery. Sand filling, steel platforms and stairs in rear, electric-light plant, ammunition service, and minor work remain unfinished. Summary of work. 1900, 949.

Preservation and repair.

Mobile, Ala.

1897. \$3,000 allotted for a fence on the eastern boundary line of Fort Morgan reservation; barbed-wire fence, 3,350 f. long, built, 97, 722. \$3,000 allotted for repair of platforms of 8-inch converted rifles and other necessary work. 97, 722.

1898. Main line of fence repaired and connection made with old fence at southeast salient of Fort Morgan, 98, 737. The platforms for 8-inch converted rifles completed and rifles and carriages mounted and turned over to the garrison. 98, 737.

1899. \$1,675 allotted and ditch cleaned, parade of old fort leveled; repairs to glacis; and sea wall partly rebuilt, 99, 930. \$1,175 allotted and ditch cleaned, 2 pumps driven by a heavy 12-f. windmill installed to discharge the drainage over the low dam into the bay. 99, 932.

1900. \$3,400 allotted. Slopes and fences repaired; old fort cleaned; waterproofing magazines with cork paint, etc. Mine material cared for; sea walls and jetties repaired. 1900, 947.

Sea walls and embankments.

Fort Morgan, Ala.

Extensive temporary breakwater built, 67, 14. Foundation begun for concrete sea wall in combination with the breakwater, 68, 18. Work begun on a sea wall to protect the western or channel front of the fort, 53 piles driven and capped for outside of the cofferdam, 790 r. f. of sheet piling completed, and 1,000 c. y. of sand removed, 73, 21. Sea wall completed, 74, 25. \$27,000 allotted for extension to sea wall; work begun, 77, 21. Extension completed, 750 f. long, 78, 24. \$3,934.75 allotted and sea wall repaired, 81, 48. \$5,570 allotted for extension and completion of the brush and stone revetment in front of sea wall; work nearly completed, 82, 46. \$3,767 allotted for completion of aprons in front of sea wall and 605 r. f. of mattresses placed, 83, 420. Estimated cost of protecting shore, \$14,000, 96, 523. Work begun on sea wall with funds remaining from allotment for Fort Gaines; 1,988.8 s. y. fascine mattress and 1,325 c. y. rock placed, completing same. 98, 737.

Fort Gaines.

270 palmetto piles driven in construction of five jetties for the protection of the shore and glacis, 73, 21. Four jetties completed, 74, 25. Estimated cost of protecting shore, \$11,000, 96, 522. \$25,000 allotted for sea wall to be built under contract, work begun, 97, 722. 4,629.9 s. y. fascine mattress and 1,989 c. y. stone placed, completing sea wall. 98, 737.

Mississippi Sound.

\$5,584 allotted for construction of 3 jetties for protection of the fort. Jetties completed and, in addition, a plank bulkhead, 714 f. long, built, 82, 47. Jetties extended, 83, 43. Jetty 480 f. long built, 84, 48. \$20,000 allotted for extending riprap sea wall, extension completed for 850 f., and the fascine mattress placed for 850 f. additional, 99, 930. Work on sea wall completed, 1,800 l. f. built, and an extension of 3701 f. built. Work in progress. Description of sea wall, and summary of work. 1900, 948.

Submarine mines.

Mobile, Ala.

1895. \$7,500 allotted for a mining casemate; work begun, 95, 11.

1896. \$3,200 allotted. Work on mining casemate and cable gallery completed,

MOBILE AND MISSISSIPPI SOUND—Continued.

except revetting slopes. Itemized cost of work. 96, 521.

1897. \$4,675 allotted. Casemate and cable gallery completed, and work begun on a cable tank. 97, 723.

1898. Casemate fitted up for operating mines on the Abbott system, and torpedo materials stored, 98, 742. Concrete cable tank completed and a traveling crane installed. Description of tank. 98, 742. 3 casemates cleaned and repaired, and torpedo material stored, 98, 743. \$1,000 allotted for planting mines; dynamite and other supplies purchased, search light installed. Mines planted and a base line selected, and stations prepared at each end of it for firing the mines by judgment; description. \$10,000 allotted for planting

torpedoes; search-light plant installed, mine field patrolled, and supplies received ready for future preparations. 98, 743.

1899. Mines and cable, and torpedo instruments, received and stored. All mines that had been planted removed by exploding same. Cable, boxes, etc., cleaned and stored. 99, 933. \$750 allotted for supplies for operating search-light plants. 99, 934.

1900. A half mile of multiple cable received, and search-light plant crated and stored, 1900, 949.

Supplies for seacoast defenses.

1900. \$600 allotted. No expenditure made. 1900, 952.

MONROE. (See *Hampton Roads.*)

MORGAN. (See *Mobile and Mississippi Sound.*)

MOTT. (See *Delaware River.*)

MOULTRIE. (See *South Carolina.*)

NEW BEDFORD, MASS. (See *Massachusetts and Rhode Island.*)

NEW HAVEN. (See *Eastern entrance to Long Island Sound and coast of Connecticut.*)

NEW LONDON. (See *Eastern entrance to Long Island Sound and coast of Connecticut.*)

NEW ORLEANS, LA., AND SABINE PASS, TEX.**Contracts.**

1897. Cement, 10,667 barrels, at \$2.37 per barrel; gravel and rock, 11,056 c. y., \$2.63 per c. y.; sand, 4,180 c. y., \$1.446 per c. y.; hollow tile, 2,000, 14¢ cents each, 97, 734.

Engineering Features.

Concrete, cost per c. y., 98, 751. Forms, 97, 732. Mixing and placing, 97, 732, 734; 99, 939. Settlement of (tracing). 90, 746; 99, 935, 938, 939, 942, 944.

Materials, cost of, 97, 734; 98, 751.

Mines, submarine, planting and removing, 98, 756; 99, 945. Suggestions for improving. 99, 948.

Pile driving (tracing), 97, 730; 98, 747, 748; 99, 941.

Plant, construction, 98, 747, 754.

Waterproofing methods, 97, 735; 98, 745, 751; 99, 936, 938, 939; 1900, 953.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 17; 67, 14; 68, 18; 69, 18; 70, 25; 71, 22; 72, 20; 73, 21; 74, 26; 75, 25; 76, 26; 77, 21; 78, 25; 79, 29; 80, 49; 81, 49; 82, 47; 83, 44; 84, 49; 85, 42; 86, 42;

95, 11; 96, 19, 523; 97, 18, 727; 98, 28, 744; 99, 32, 934; 1900, 28, 952.

BOARD OF ENGINEERS. Constituted 1882, to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with, 82, 425.

ENGINEERS IN CHARGE:

Capt. J. C. Palfrey, 1866.
Capt. J. M. Wilson, 1866.
Maj. M. D. McAlester, 1866-69.
Capt. W. E. Merrill, 1866.
Maj. F. E. Prime, 1869.
Capt. G. J. Lydecker, 1869.
Maj. C. W. Howell, 1869-82.
Maj. A. Stickney, 1882-85.
Capt. T. Turtle, 1885.
Maj. W. H. Heuer, 1885-86.
Maj. J. B. Quinn, 1895-1900.
Lt. C. S. Riché, 1897.
Maj. H. M. Adams, 1900.

ASSISTANTS:

Lt. F. W. Allstaetter, 1898-99.
Capt. H. Jervy, 1897-99.
Lt. C. S. Smith, 1899-1900.
Lt. H. Burgess, 1899.

NEW ORLEANS, LA., AND SABINE PASS, TEX.—Continued.

Forts and batteries.^a—Operations.

Fort Pike, Rigolets Pass, La.

1819. Work begun, 80, 49.

1870. Estimated cost of proposed modifications, necessary repairs, and placing in the curved barbette battery a number of 10-inch rifled guns, with traverses between them, \$24,000 allotted, a breakwater built along the Rigolets, and a new wharf built, 70, 25.

1871. \$2,000 allotted for care and preservation, 71, 22.

1872. Bridges, quarters, and breakwater repaired, 72, 20.

1873. Repairs to bridge and brick covering of terreplein of main work, and shingle revetment of slopes over breast-height wall of covered way replaced with a sodded slope, 73, 21.

1874-79. Necessary repairs, 74, 26; 75, 25; 76, 26; 77, 21; 78, 25; 79, 29.

1880. History of the fort, its importance, 80, 49.

1884. Minor repairs of bridges; grass, weeds, etc., cut from around the walls and inclosures, 84, 49.

1885. Grass and weeds cut, 85, 42.

Fort Macomb, Chef Menteur Pass, La.

1822. Work begun, 80, 49.

1870. Estimated cost of proposed modifications, \$24,000, 70, 25.

1871. \$4,000 allotted for care and preservation, 71, 23.

1872-79. Care and preservation, 73, 22; 74, 26; 75, 25; 76, 26; 77, 22; 78, 29.

1880. History; and importance, 80, 49.

1885. Grass and weeds cut, 85, 42.

Fort Jackson, Mississippi River, La.

1822. Work begun, 80, 50.

1866. Work begun reinforcing barbette platforms to adapt them to larger calibers, 66, 17.

1867. Modification of 22 barbette platforms completed, 16 shot platforms finished, and 2 platforms for 13-inch mortars begun, 67, 14.

1868. Repairs to levees and to main work, 68, 19.

1869. Lightning rods erected over magazines, and slight repairs made, 69, 18.

^a List of works as arranged under this head—

Fort Pike.
Fort Macomb.
Fort Jackson.
Battery Bienvenue, Lake Borgne, La.
Tower Dupres, Lake Borgne.
Fort St. Philip.
Fort Livingstone.
Tower at Proctorville, Lake Borgne.
New Orleans—Emplacement for two 10-inch guns.

1870. Estimated cost of proposed modifications \$191,000, 90, 26.

1871. \$50,000 appropriated. Levees repaired and property cared for, 71, 23.

1872. \$64,000 appropriated. Work begun, necessary buildings erected, plant purchased, levees and a draining machine to protect the site of the fort from overflow built, slopes repaired, railroad built, and completion of concrete work for 5 magazine traverses in the lower battery, 72, 21.

1873. \$65,000 appropriated. East battery, 2 covered-face batteries, and battery in the north bastion of main work completed, except gun platforms and masonry breast-height walls, 73, 22.

1874. \$30,000 appropriated. Work on drainage, regrading new earthwork, providing 20 wooden platforms for 15-inch guns, laying 4 foundations for platforms, providing material for 16 foundations, and constructing concrete piers for 3 bridges across moat, 74, 25.

1875. \$25,000 appropriated. Completion of 18 emplacements for 15-inch guns; work on permanent breast-height walls, slopes, bridges, casemate store-rooms, quarters, and minor work, 75, 28.

1876. Sally port built to connect lower battery with lower covered-way battery; work on 2 platforms and breast-height wall, magazine traverses, and repairs to slopes, etc., 76, 27.

1877-79. Care and preservation, 77, 22; 78, 26; 79, 30.

1880. History: description and importance, 80, 50.

1883. Work on levees, 83, 45.

1884. Repairs to bridges, quarters, and buildings, drains cleaned; 12 shot beds built, and shot and shell piled; a number of guns, carriages, and chassis moved and blocked; levees completed, and a temporary revetment placed to protect the new levee, 84, 50.

1885. New wharf built, and 2 stone platforms for 15-inch guns completed, 85, 44.

1886. 8 concrete and wooden platforms for 15-inch guns replaced with concrete platforms for same guns, and a new levee built, 86, 44.

1898. Repairs of buildings, bridges, fences, resurfacing elevated gallery of main work; a number of old guns mounted, 98, 745.

List of works as arranged under this head—Cont'd.

New Orleans—Eight-inch battery.
New Orleans—Two 4.7-inch batteries.
New Orleans—Eight-inch B. L. rifles.
New Orleans—Eight-inch B. L. rifles.
Sabine Pass—Eight-inch rifle battery.
Sabine Pass—Temporary siege batteries.
New Orleans—First battery, 15-pounder guns.
New Orleans—Second battery, 15-pounder guns.
Sabine Pass—Eight-inch rifle battery.

NEW ORLEANS, LA., AND SABINE PASS, TEX.—Continued.

Battery Bienvenue, Lake Borgne, La.

1826. Work begun, 80, 50.

1871. \$1,000 allotted for care and preservation, 71, 23.

1872. Quarters, slopes, and bridges repaired, 72, 20.

1873-77. Care and preservation, 73, 22; 74, 26; 75, 26; 76, 26; 77, 22.

1880. History and importance of battery, 80, 50.

Tower Dupres, Lake Borgne, La.

1830. Work begun, 80, 50.

1871. \$1,000 allotted for care and preservation, 71, 23.

1873. Some floors relaid, interior of walls of tower repaired, doors hung, and tower cleared of rubbish, 73, 22.

1874. Repairs of tower completed and a keeper placed in charge, 74, 26.

1877. Care and preservation, 77, 22.

1880. History, 80, 50.

Fort St. Philip, Mississippi River, La.

1841. Work begun, 80, 51.

1866. Reenforcing the barbette platforms to adapt them to heavier guns begun and nearly completed, 66, 17.

1867. The magazine in the lower battery, 15 new gun platforms, 2 mortar platforms, with necessary modification of parapets, breast-height walls, and terrepleins completed, and repairs made to bridge across ditch and to 2 gun platforms, 67, 14.

1868. Levees repaired, and a new levee built from the lower end of the front levee to the bayou, 68, 19.

1869. Minor repairs, 69, 18.

1870. Estimated cost of proposed modifications, \$108,000. Minor repairs to levees, 70, 26.

1871. \$37,500 appropriated, 71, 23.

1872. \$42,500 appropriated. Modification work begun. Necessary buildings erected for employees, levee rebuilt, wharf repaired; completion of concrete work for 2 magazines and work in progress on 3 others; building parapet of new battery, 72, 21.

1873. \$50,000 appropriated. Completion of levee, 6 traverse magazines in the new and lower water battery, and demolition of the old works. Emplacements for 12 guns ready for platforms, 73, 22.

1874. \$30,000 appropriated. Completion of 3 magazine traverses, parapet, and temporary breast-height wall of the lower battery; repairs to slopes; demolition of old magazines, and minor work. Summary of work, 74, 27.

1875. \$25,000 appropriated. Completion of 6 magazine traverses; repairs to temporary breast-height walls; com-

pletion of 18 platforms for 15-inch guns; minor work and repairs, 75, 26.

1876. 3 magazines built and 3 traverses completed up to the crown of the arches; foundation of sallyport completed and weighted; 2 wooden platforms placed, and excavation made for 7 more; wharf extended and repaired; drains built; reservation resurveyed and the boundaries marked with stone monuments, 76, 27.

1877-79. Care and preservation, 77, 22; 78, 26; 79, 30.

1880. History and description, 80, 51.

1884. 8 new shot beds built, 3 repaired; guns, carriages, and chassis blocked up, ditches and drains cleaned, bridges repaired, new levee built in front of the old one, a barbed-wire fence built along the river front and on the levee, 84, 51.

1885. New wharf built, and a barbed-wire fence built to keep cattle off the levee and grounds, 85, 44.

1886. Replacing 8 concrete and wooden platforms for 15-inch guns with concrete platforms, 86, 44.

1898. Repair of buildings, bridges, roof of magazine; minor work; a number of old guns mounted, 98, 745.

Fort Livingstone, Baratavia Bay, La.

1842. Work begun, 80, 51.

1870. Estimated cost of proposed modification, \$38,000, 70, 26.

1871. \$202.50 expended on general repairs. \$2,500 allotted for care and preservation, 71, 24.

1873-79. Care and preservation, 73, 23, 74, 27, 75, 26, 76, 27, 77, 22, 79, 31.

1880. History and description, 80, 51.

1884. Repairs to slopes; shot beds built, dismounted guns raised and blocked; minor work, 84, 51.

1885. Quarters repaired, 85, 45.

1886. Survey made, and plans and estimates prepared for jetties to protect shore line of site from further erosion by the sea, 86, 44.

Tower at Proctorville, Lake Borgne, La.

1856. Work begun, 80, 50.

1871. \$360 allotted for care and preservation, 71, 23.

1875-79. Care and preservation, 75, 26, 76, 27, 77, 22, 78, 25, 79, 30.

1880. History and importance, 80, 50.

New Orleans, La.—Emplacements for two 10-inch guns.

1895. \$70,000 allotted. Plans being prepared, 95, 11.

NEW ORLEANS, LA., AND SABINE PASS, TEX.—Continued.

1896. \$55,000 allotted. Work begun, necessary buildings for employees erected. Piles driven in the emplacements of the battery, and part of the excavation completed. \$850 allotted for an iron-girder bridge across moat. Work completed under contract for \$599. **98, 524.**

1897. \$38,000 allotted. Plans revised. 11,000 c. y. concrete and 12,000 c. y. earth placed, nearly completing concrete work and parapet; ironwork placed; because of concrete work of parapet and platforms settling, more work required. Summary of work, with itemized cost. **97, 727.**

1898. \$9,000 allotted. Platforms releveled, guns and carriages mounted, and the completed battery turned over to the artillery June 7, 1898. Description of releveing, with tracing. **98, 746.**

1900. \$216 allotted. Hand rails placed. **1900, 953.**

New Orleans, La.—8-inch battery—Emplacements for two 8-inch rifles on disappearing carriages.

1898. \$90,500 allotted. Work delayed because of yellow fever. Pile driving begun in Dec., 1897, 1,340 piles driven; concrete work begun on Apr. 6, 1898. Guns and carriages mounted, and work nearly completed. Description of pile driving, with tracing; waterproofing; itemized cost of battery. **98, 746.**

1899. Battery completed and guns tested; report, with tracing, of the settling of the battery. \$3,300 allotted for earth filling between 8-inch and 10-inch batteries, and building a concrete walk in rear. 4,000 c. y. earth placed, and a walk 550 f. long 8 f. wide built. **99, 934, 936.**

New Orleans, La.—Battery for two 4.7-inch R. F. guns.

1898. \$7,000 allotted. Guns to be mounted temporarily on the face cover, using the existing magazines and parapets. **98, 752.**

1899. Emplacements completed, guns mounted and tested, old magazine repaired, and earthwork completed and sodded, **99, 936.**

New Orleans, La.—8-inch B. L. rifles mounted on 15-inch S. B. carriages. (See Emplacements for 8-inch guns on disappearing carriages.)

1898. \$10,000 allotted. No work done awaiting the arrival of 8-inch rifles. **98, 752.**

1899. Guns received. Work begun on altering carriages; work completed and guns mounted. Heavy concrete breast wall built in front of the old platforms;

some earth filling. Guns dismantled and transferred to other emplacements. **99, 937.**

New Orleans, La.—Emplacements for two 8-inch rifles on disappearing carriages. (See Emplacements for 8-inch rifles on 15-inch S. B. guns.)

1898. \$125,000 allotted. Work begun, wharf built, pile driving completed; concrete work in progress. Description and cost of plant and summary of work and difficulties attending it. **98, 753.**

1899. \$25,000 allotted. Concrete work completed, 3,800 c. y. placed, carriages received and mounted. Description of waterproofing. Settlement, and general work. **99, 937.** \$1,600 allotted. Rifles transferred on a deck barge and mounted by June 17, 1899. **99, 940.**

1900. \$34 allotted. Hand rail placed on one emplacement. **1900, 953.** Carriages cleaned and leveled. \$600 allotted for ammunition hoists; erected. \$4,848 allotted for removing old brick parapet, so as to give a clear view of the river. Part of old parapet and an old magazine on the parapet blasted and removed, 4,000 c. y. earth removed from tops of 5 old magazines, 13 obsolete guns and carriages dismantled and stored. **1900, 955.**

Sabine Pass, Tex.—Battery for 8-inch rifle on 15-inch S. B. carriage.

1898. \$6,000 allotted. Work begun June 6; about one-fourth completed. \$3,120 allotted for wharf, work begun, and nearly completed. **98, 764.**

1899. Earthwork and magazine and platform completed. Gun and carriage received. Carriage altered and gun mounted. All ordnance and ordnance stores turned over to the ordnance sergeant. A wharf 960 f. long completed. **99, 948.**

Sabine Pass, Tex.—Temporary siege batteries.

1898. \$4,200 allotted for temporary batteries for 2 5-inch siege guns and 2 7-inch siege howitzers. Work begun in April and completed. Armament received and mounted. All guns, carriages, armament, and ammunition pertaining to these guns were shipped to Tampa, Fla., and 4 light 12-pounder S. B. guns and carriages for same were mounted; work incomplete. **98, 764.**

1899. Embrasures cut in breast-height wall to permit the use of smaller guns, and parapet raised. Lease of land changed to include sufficient ground for an 8-inch gun emplacement. **99, 949.**

NEW ORLEANS, LA., AND SABINE PASS, TEX.—Continued.

New Orleans, La.—First battery—emplacement for two 15-pounder R. F. guns.

1899. \$24,500 allotted. Work begun December 28, 1898. Excavations, pile-driving, grillage, and concrete work nearly completed; earth slopes finished and battery completed awaiting the mounts. Summary of work. 99, 940.

1900. Earth slopes repaired. Wires placed for electric lights and walk to connect with 8-inch and 10-inch batteries built. No guns or carriage received. 1900, 952.

New Orleans, La.—Second battery.—Emplacements for two 15-pounder R. F. guns.

1899. \$24,500 allotted. Work begun December 28, 1898. Excavations, pile driving, earth slopes, and concrete work completed, awaiting arrival of mounts. Summary of work. 99, 941.

1900. Electric wires placed. Earth slopes repaired and parade graded. No guns or carriages received. 1900, 955.

Sabine Pass, Tex.—Battery for 8-inch rifle on 15-inch S. B. carriage.

1899. \$6,000 allotted. Work begun June 6; about one-fourth completed. \$3,120 allotted for wharf; wharf 960 f. long completed. Gun and carriage received. Carriage altered and gun mounted. All ordnance and ordnance stores turned over to the ordnance sergeant. 99, 948.

Miscellaneous.

Electric-light plants.

1899. \$1,146.84 allotted, and plants installed; description, with cost, 99, 942. \$5,250 allotted for a permanent house, house completed, but, owing to the unequal settlement of foundations, the wall fell in. New site selected and work begun. 99, 943. \$1,900 allotted for operating electric plant; necessary materials purchased. 99, 944.

1900. Permanent house for electric plant completed; dynamos, boiler, and engine cleaned, repaired, and placed on their foundations, and the completed building transferred to the garrison, 1900, 952.

Releveling gun platforms, etc., of new batteries.

1900. \$6,545 allotted. 8-inch and 10-inch emplacements—magazines water-proofed and gun platforms relevelled. \$400 allotted for raising and leveling base rings of 10-inch battery; work completed. 1900, 953.

Preservation and repair.

1898. \$4,000 allotted. Fort St. Philip—repairs to buildings, bridges, magazines, and cisterns. Fort Jackson—repairing bridges, fences, and gallery of main fort. \$3,500 allotted for mounting old guns at Forts Jackson and St. Philip; work completed. 98, 744.

1899. New Orleans—\$1,000 allotted for repairs to slopes and machinery, and care of property. \$250 allotted for moving and storing torpedoes and preparing a casemate for same. \$3.25 allotted for a new tangent wheel for ammunition lift at 10-inch battery. 99, 944. Sabine Pass—\$310 allotted for repair of magazine floors, drains, buildings, erecting a wire fence, and care of property. 99, 950.

1900. New Orleans—\$1,870 allotted. General repair of guns and carriages, slopes, buildings, and machinery. 1900, 953. \$4,219.50 allotted; slopes repaired, torpedo material cleaned and stored, plant cleaned and repaired, gun platforms relevelled, care of property. 1900, 955.

Sea walls and embankments.

Fort Jackson.

\$5,926.21 allotted for construction and repair of levees; work in progress, 83, 45. Levee completed and a temporary revetment built to protect same, 84, 50. New levee built, 86, 44.

Fort St. Philip.

New levee built in front of the old one from the upper end of the reservation to where the back levee begins, and from this point to the lower end of the reservation part of the old front levee was repaired. The back levee rebuilt. 84, 51.

Submarine mines.

1898. New Orleans—\$26,500 allotted. Mines planted. Description in detail, with cost, 98, 755. Sabine Pass—\$3,600 allotted; mines, dynamite, and electrical supplies received and stored, awaiting receipt of cables, 98, 764.

1899. New Orleans—\$2,714.93 allotted for installing searchlight and operating casemate, work completed, 99, 942. \$5,366.23 allotted for torpedo defense of New Orleans; all mines removed. Description of method of removing mines, with results and suggestions for improvement, 99, 945. Sabine Pass, Tex.—10 mines, with necessary supplies, received. No mines planted. All torpedo material transferred to ordnance sergeant, 99, 950.

1900. \$3,675 allotted for a torpedo storehouse; work completed and material stored, 1900, 956.

NEWPORT, R. I. (See *Massachusetts and Rhode Island.*)

NEW YORK HARBOR.

Contracts.

1883. Sea wall, \$18.72 per l. f., **83**, 385.

1889. Sea wall, concrete foundation, 375 c. y., \$14.70 per c. y.; wall, 1,450 c. y., \$15 per c. y.; and dowels 25 cents per pound. Embankment, 24,000 c. y., at 22½ cents per c. y., **89**, 461. Riprap, 9,050 tons, \$1.50 per ton; capping stone, 980 l. f., \$7 per l. f. Embankment, 35,000 c. y., 40 cents per c. y. **89**, 458.

1891. Sea wall, 1,000 c. y. of foundation, \$11 per c. y.; 1,510 l. f. wall, \$19 per l. f.; 43,000 c. y. filling, 29 cents per c. y., **91**, 527.

1897. Small broken stone, 5,000 c. y., \$1.07 and \$1.29 per c. y., 100 c. y. fine sea washed silica, \$2.50 per c. y. Rosendale cement, 12,000 barrels, 74.8 cents per barrel, **97**, 617. Concrete battery for 3 10-inch guns, \$78,202.50, **97**, 627.

1898. Rosendale cement, 18,000 barrels, 66.6 cents per barrel. Riprap stone, 47,500 tons, \$1.19 per s. t. Broken stone, \$1.04 per c. y. **98**, 633.

1900. Portland cement, 25,000 barrels, \$1.99 per barrel. Broken stone, 21,000 c. y., 84 cents per c. y. Sand, 11,000 c. y., 34 cents per c. y., **1900**, 836.

Engineering features.

Ammunition for a gun lift, handling of, **93**, 610.

Ammunition lifts, test of, **97**, 619.

Anchor bolts, method of setting, **94**, 453.

Battery, 10-inch, cost in detail, **97**, 616, 621.

Concrete in place, cost of, **92**, 5; **93**, 602, 605, 609; **94**, 458; **1900**, 835, 837.

Concrete mixing, description, **97**, 620.

Electric conduit system, cost, **1900**, 837.

Electric-light plant, description, **93**, 611.

Embankments, cost per c. y. in place, **92**, 603.

Embankment, methods of placing sand, **93**, 605.

Excavation, sand, cost of, by hand and by grapple, **93**, 603.

Firing, experimental, result on concrete, **93**, 612, 614.

Fire, test of rapidity of, **97**, 619.

Gun, 12-inch, method of mounting, **93**, 615; **94**, 453.

Gun-lift mechanism, test of, **93**, 613.

Materials, cost, **93**, 602, 605; **94**, 454, 458; **97**, 763, 769.

Mortar platforms, method of excavation for foundation, **94**, 450.

Pavements, cost of, **97**, 616.

Plant, arrangement of, **93**, 605; **99**, 763, 766, 774.

Platforms, settlement of, **97**, 612.

Quoins, granite, cost of, **97**, 616.

Stone (large) in place, cost of, **92**, 5.

Torpedo shed, description and detailed cost, **93**, 617; **94**, 448.

Walls, counterscarp and gallery; a smooth and apparently waterproof surface, securing, **93**, 606.

Waterproofing and cost of, **1900**, 828, 829, 831, 839.

Water-supply system, **93**, 613.

Engineers.

CHIEF OF ENGINEERS. Reports, **66**, 8; **67**, 7; **68**, 11; **69**, 11; **70**, 17; **71**, 12; **72**, 10; **73**, 9; **74**, 11; **75**, 11; **76**, 11; **77**, 8; **78**, 10; **79**, 14, 233; **80**, 27, 292; **81**, 25, 385; **82**, 20; **83**, 16; **84**, 22; **85**, 16; **86**, 5, 17; **87**, 5; **89**, 6, 458, 459; **90**, 5, 381; **91**, 7, 9, 525; **92**, 5, 12, 457; **93**, 6, 599; **94**, 7, 449; **95**, 7, 504; **96**, 8, 473; **97**, 13, 610; **98**, 18, 624; **99**, 20, 762; **1900**, 19, 827.

BOARD OF ENGINEERS:

Constituted, 1882, to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with. Report, **82**, 403.

Estimate, **87**, 11; **90**, 6.

ENGINEERS IN CHARGE:

W. P. Trowbridge U. S. agent, 1866.
Lt. Col. H. L. Abbot, 1866-86.
Capt. F. Harwood, 1866.
Lt. Col. J. C. Duane, 1866-68.
Maj. F. E. Prime, 1866.
Capt. C. N. Turnbull, 1866.
Maj. N. Bowen, 1866-69.
Lt. Col. J. Newton, 1866-77.
Col. J. G. Barnard, 1866-87.
Col. Q. A. Gillmore, 1867-86.
Capt. J. Mercer, 1877-78.
Col. H. W. Benham, 1878-82. Report, **79**, 234; **80**, 293.
Col. G. L. Gillespie, 1883-97.
Capt. J. C. Post, 1883.
Lt. Col. C. B. Comstock, 1886.
Lt. Col. W. MacFarland, 1886.
Col. D. C. Houston, 1886-93, report, **92**, 459.
Lt. Col. W. R. King, 1891-95.
Lt. Col. H. M. Robert, 1893-96.
Lt. T. H. Rees, 1893.
Lt. R. McGregor, 1895.
Maj. W. T. Russell, 1896.
Maj. J. G. D. Knight, 1896-1900.
Maj. H. M. Adams, 1896-1900.
Lt. Col. W. Ludlow, 1897-98.
Lt. Col. W. H. H. Benyaurd, 1900.
Maj. W. L. Marshall, 1900.

ASSISTANTS.

Lt. E. Griffin, report, **80**, 293.
Lt. H. Taylor, 1891-92.
Lt. J. G. Warren, 1892-94.
Lt. T. H. Rees, 1893.
Lt. W. P. Craighill, 1894-96.
Lt. R. McGregor, 1894-99.
Lt. R. R. Raymond, 1897-99.

NEW YORK HARBOR—Continued.

Lt. J. F. McIndoe, 1898-1900.

Lt. E. R. Stuart, 1898-99.

Lt. J. J. Morrow, 1899-1900.

Lt. J. A. Woodruff, 1898-1900.

Forts and batteries.^a—Operations.

Southern entrance—Fort Lafayette.

1812. Work begun, 80, 29.

1866. Important modification required, 66, 10.

1868. Test borings on proposed site of new work. Fort injured by fire in Dec., 1868. 68, 13.

1878. Project for heavy armament, estimate, \$784,212, 78, 13.

Fort Hamilton and additional batteries.

1824. Work begun, 80, 29.

1866. Work on north, south, and

small traverse magazines; setting pintle and traverse stones, traverse iron, and pintles; breast height wall and earth in parapet. Traverse magazines 1, 2, and 4 completed; 3 and 5 suspended. 66, 10.

1867. Work on south magazine; taking up platforms to make room for traverse magazines; revetment and platform flags; traverse stones rebbed, embankment, and minor work. Condition of work. 67, 9.

1868. 1 traverse magazine lengthened, 5 nearly completed. The north and south magazines now completed, except minor work. 68, 12.

1869. North and south magazines nearly completed, 9 magazine traverses finished; 3,464 l. f. drain built; 991 l. f. sea wall rebuilt; 3,407 s. f. slopes repaired.

^a List of works as given under this head—

Southern Entrance.—Fort Lafayette.

Fort Hamilton.

Defenses of Governors Island.

Eastern entrance.—Fort Schuyler.

Bedloes Island.—Fort Wood.

Mortar battery, Fort Hamilton.

Staten Island.—Battery Hudson.

Staten Island.—Fort Wadsworth.

Fort.—Sandy Hook.

Fort on site of Fort Tompkins.

Staten Island.—South Cliff battery.

Staten Island.—North Cliff battery.

Eastern entrance.—Fort at Willets Point.

Governors Island.—Castle William.

Governors Island.—Fort Columbus.

Fort Hamilton and redoubt.

Staten Island.—New casemated battery.

Governors Island.—South battery.

Staten Island.—Glacis mortar battery.

Staten Island.—South mortar battery.

Staten Island.—Glacis gun battery.

Governors Island.—New barbette battery at Fort Columbus.

Staten Island.—Two-gun battery.

Southern Entrance.—Mortar battery, No. 1.

Eastern Entrance.—Battery for 16 12-inch mortars.

Eastern Entrance.—Five-gun battery.

Eastern Entrance.—Gun battery (south side of entrance).

Southern Entrance.—Gun-lift battery 1.

Southern Entrance.—Seven-gun battery.

Eastern Entrance.—Platforms for target practice.

Eastern Entrance.—Emplacement 1, 12-inch rifle.

Eastern Entrance.—Two emplacements for 10-inch rifles.

Eastern Entrance.—Mortar battery for 12-inch mortars.

Eastern Entrance.—Two 2-gun batteries.

Southern Entrance.—Battery of 3 10-inch and 4 12-inch guns.

Southern Entrance.—Five-inch R. F. battery.

Southern Entrance.—Ten-inch battery.

Eastern Entrance.—Two emplacements for 5-inch R. F. guns.

Southern Entrance.—Mortar battery, 12-inch mortars.

Southern Entrance.—R. F. guns.

Southern Entrance.—Twelve-inch battery.

Eastern Entrance.—R. F. guns.

Eastern Entrance.—Temporary batteries.

Eastern Entrance.—Twelve-inch emplacement, Battery Hudson.

Eastern Entrance.—Twelve-inch emplacement, Battery Richmond.

Eastern Entrance.—Two emplacements for 8-inch B. L. rifles.

Southern Entrance.—Pneumatic gun battery.

Southern Entrance.—Six-inch R. F. battery.

Eastern Entrance.—Emplacement, 2 for 12-inch rifles.

Eastern Entrance.—Two emplacements for 5-inch R. F. guns.

Eastern Entrance.—Two emplacements for 15-pounder R. F. guns.

Eastern Entrance.—Two emplacements for 16-pounder R. F. guns.

Southern Entrance.—Twelve-inch battery.

Southern Entrance.—Six-inch battery.

Southern Entrance.—Two 15-pounder R. F. guns.

Eastern Entrance.—Two emplacements for 6-inch guns.

Eastern Entrance.—Two emplacements for 15-pounder R. F. guns.

Eastern Entrance.—Two emplacements for 6-inch R. F. guns.

Southern Entrance.—Fifteen-pounder R. F. emplacement.

Eastern Entrance.—Two emplacements for 5-inch R. F. guns.

Southern Entrance.—Two additional emplacements for 15-pounder R. F. guns.

NEW YORK HARBOR—Continued.

Estimated cost of additional batteries for heavy guns, \$135,000. **69**, 12.

1870. Completion of north and south magazines and traverse magazines, repairs made to slopes and parapet; terreplein and public road graded, repairs to sea wall, and drainage, **70**, 18.

1871. \$25,000 appropriated. Work begun on cofferdam 483 f. long, on water battery 1. **71**, 14.

1872. \$40,000 appropriated. Sea wall ready for coping, and in rear filled with earth to 2 f. below top. **72**, 11.

1873. \$40,000 appropriated. Sea wall of battery 1 completed; magazines 1 and 2 nearly finished; work on magazines 3 and 4; 8,464 c. y. of earth placed in parade. **73**, 10.

1874. \$26,000 appropriated. Battery 1—Magazines 1, 2, 3, and 4 completed and sodded. Drain placed, terreplein graded and parapet raised to proper level. 15-inch gun battery—5-inch pintles taken out and replaced with 6-inch ones. **74**, 13.

1875. \$10,000 appropriated. Battery 1—2 wooden platforms and 6 stone platforms nearly finished, raising breast-height wall. **75**, 13.

1876. Battery 1—Platforms and breast-height wall completed; parapet and end of traverses raised, and rear slopes sodded, **76**, 14.

1877-78. Repair of gates and slopes, **77**, 10; **78**, 12.

1881. Waterproofing terrepleins and casemates, repair of slopes and fences, **81**, 28.

1882. Waterproofing terrepleins and casemates, drainage work, sea wall and minor repairs, **82**, 24.

1883. Work on relaying brick pavements, wooden bridge, drainage, slopes, and buildings, **83**, 20.

1884. Repair of slopes, chimneys, drains, etc., **84**, 25.

1885. Repair of platforms, breast-height, sustaining and sea wall; placing additional traverse stones in platforms, relaying pavements and replacing stone flagging of parade, **85**, 18.

1886. 1,190 c. y. riprap stone placed against sea wall; hanging 7 magazine doors; setting pintles in platforms, **86**, 19.

Defenses of Governors Island. (See Fort Columbus, Castle Williams, South Battery, and New Barbette Battery, below.)

1831. Fortifications on Governors Island begun, **80**, 28.

1819. Estimate for a sea wall 1,800 l. f. long, 8 f. high, \$36,000, including wall on west shore; cost, \$40,000. Extracts from letters from Maj. Gen. Hancock,

Capt. J. P. Sanger, Col. and Surg. Cuyler, and Col. Benham in reference to explanation of the estimates for sea wall. **79**, 15, 233; **80**, 28, 293.

1881. Scarp wall color-washed and terreplein covered with asphalted felting. Sea wall estimate. **81**, 26, 393.

1882. Bridge across ditch at Fort Columbus repaired, **82**, 22.

1883. Exterior slopes of southwest bastion of Fort Columbus repaired and resodded; first and second interior galleries at Castle William partly rebuilt, repaired, and painted, **83**, 18.

1884-86. Preservation and repair, **84**, 24; **85**, 17; **86**, 18.

Eastern entrance—Fort Schuyler, East River (north side of eastern entrance).

1833. Work begun, **80**, 27.

1866. Work on service magazines; glacis repaired, paving in sallyport renewed, sea wall repaired, and buildings repaired and altered, **66**, 8.

1867. 2 service magazines completed; work on two others; 15-inch gun platforms; stone parapet and breast-height walls; repair of buildings, **67**, 7.

1868. 2 service magazines completed; laying 2 15-inch gun platforms on the cover face; modifying casemates of lower tier of main work to adapt them for new iron carriages of 10-inch guns, and repair of wharf and buildings, **68**, 11.

1869. Completing new magazines and gun platforms of the cover face, modifying casemates of second tier for 8-inch gun carriages (iron), placing gratings and shutters, and minor repairs. Estimated cost of modifications, \$308,000. **69**, 11.

1870. Care and preservation, **70**, 17.

1871. \$57,500 appropriated. Modification work begun, emplacements for 4 heavy guns completed on cover face; in the place-of-arms the parados, covering 2 magazines and a large bomb proof, completed; new battery for 3 modern guns, at north end of covered way, completed; minor repair of sea wall, buildings, etc. **71**, 13.

1872. \$85,000 appropriated. 3 brick arches, 1 heavy abutment pier, part of the new parade wall, and new coping to scarp wall built; bridge across both ditches completed; and minor work. **72**, 10.

1873. \$65,000 appropriated. 2 large and 2 small brick arches built in north front of main work; all arches covered with concrete and mastic; 1 traverse magazine built and partly covered with sand; new parade wall completed; removal of old stone parapet and parade

NEW YORK HARBOR—Continued.

wall in northeast front; 1 abutment and 2 intermediate piers built, and another abutment pier nearly completed; 2 stone arches turned. In 10-gun battery emplacements for 3 heavy guns provided, 4 traverse magazines built; 2 traverses, part of the parados, and half of parapet built. 73, 9.

1874. \$25,000 appropriated. Main work: North front—earthen parapet embanked and exterior slope graded; two center pintle platforms for 15-inch guns laid; traverse magazine No. 1 completed and partly sodded; traverse magazine No. 2 built, covered with mastic; minor work. Northeast front—parade wall finished and coping of scarp wall set; pier completed; casemate arches covered with mastic; minor work. Southeast front—abutment pier completed, two others built, and work on a third, old parade wall, stone parapet, and gun platforms removed, and minor work. 10-gun battery—parapet, epaulement, and parados graded and sodded, and minor work. 74, 11.

1875. \$25,000 appropriated. Main work: North face—work on earth and sand filling and completing platforms. Northeast face—work on traverse magazines 3 and 4. Southeast face—2 piers built, work on communicating arches, and all coping on this face backed with concrete. 10-gun battery—bonnet with its retaining wall built; work on parapet. Torpedo casemate completed and 141 l. f. of torpedo gallery finished. 75, 11.

1876. Main work: North face—work on earth parapet, and minor work. Northeast face—magazine No. 4 completed; work on retaining wall and slopes. Southeast face—brick revetment built on coping of scarp wall; asphalt and lime mortar applied to large arch and coping of scarp wall; work on parapet. South face—old stone parapet and 1 platform removed, torpedo gallery completed. 10-gun battery—work on rubblestone wall, 76, 12.

1877-85. Care and preservation, 77, 9; 78, 11; 79, 14; 80, 27; 81, 25; 82, 20; 83, 16; 84, 22; 85, 16.

Bedloes Island.—Fort Wood.

1841. Work begun, 80, 28.

1867. Drainage work. Island quarantined because of cholera. 67, 8.

1868. Repairing exterior walls and coping of magazines, coping of parade wall, mason work of steps, posterns, and brick walls of barracks, 68, 12.

1869. Pavement in sallyport relaid and masonry of sea wall pointed. Modification of exterior earthen battery for heavy guns cost \$3,200, 69, 12.

1870. 2 magazines supplied with conductors and connections for the rods, 70, 18.

1871. In the new water battery, 5 traverse magazines built, parapet built entire length of battery, and terreplein raised to the proper height, 71, 13.

1872. \$17,000 appropriated. Entrances to magazines, and exterior water battery completed; part of parapet raised to proper height. 72, 11.

1873. Raising parapet, pointing and cementing magazines of the exterior battery, 73, 10.

1874. Grading and sodding magazines, raising parapet, and drainage, 74, 12.

1875. 5 temporary magazine doors built and magazines covered with earth, 75, 12.

1876. Terreplein graded and parapet filled in on the exterior water battery, 76, 13.

1877. Site selected for pedestal of the Statue of Liberty presented by citizens of the French Republic, 77, 10.

1883. Minor repairs. Erection of the Statue of Liberty begun. 83, 20.

1884. Minor repairs. Concrete foundation for the Statue of Liberty completed. 84, 25.

1885. Doors provided for 3 magazines. Pedestal for the Statue of Liberty completed, height 93 f. 8 in. above m. l. w. 86, 18.

1886. Placing magazine doors. Statue of Liberty being placed. 86, 19.

Mortar battery, Fort Hamilton.

1841. Work begun, 80, 29.

1872. Funds derived from general appropriation for mortar batteries. 6 traverse magazines, including 3 service magazines, built; terreplein and parapet also sodded. 72, 11.

1873. Earth placed on magazines and traverses, and sodded; exterior and interior slopes graded and sodded; drainage begun, 73, 11.

1874. Main drain completed, exterior slopes sodded, 3 magazines supplied with doors, 5 wooden platforms laid, and concrete foundations for the remaining 8 put down, 74, 13.

1875. 7 wooden platforms placed, and exterior slope partly sodded, 75, 13.

1876. Drainage. Terreplein graded and soil placed on slopes. 76, 14.

1886. Furnishing and hanging 3 exterior doors, 86, 20.

Staten Island.—Battery Hudson.

1841. Work begun, 80, 31.

1866. Repairs to slopes and minor work, 66, 11.

NEW YORK HARBOR—Continued.

1867. Catch basin and trap built; drainage, **67, 10.**

1868. Cleaning drains and traps; cutting grass, **68, 13.**

1869. Entire slope in rear of battery washed into terreplein, slope repaired, lining with wood begun on the two principal magazines; modification of battery for heavy guns and an earth extension; estimated cost, \$62,000, **69, 13.**

1870. Furring with wood the two principal magazines, and repair of slopes; building a dry stone wall over the casemated arch of the experimental casemate target, **70, 19.**

1871. \$16,000 appropriated. 2 service magazines built. Excavation to form the rear slope; filling, over the magazines, **71, 15.**

1872. \$17,000 appropriated. Platform and parapet for King's carriage and entrance-retaining walls built. In Battery Hudson extension—principal magazines and rear slope sodded; excavation for terreplein; earthwork of 2 traverse magazines formed; modification approved. **72, 12.**

1873. \$29,000 appropriated. Old light-house removed, 3 10-inch guns dismounted, and platforms removed; 1 15-inch front pintle platform nearly finished. In the extension—earthwork of 2 traverses and the retaining wall changed to a more gentle slope. **73, 12.**

1874. \$13,000 appropriated. Removal of 6 guns and platforms of old armament; 5 front pintle platforms placed. In the extension—5 timber platforms with high traverse rails laid. **74, 14.**

1875. \$15,000 appropriated. Work on earth cover of north and south principal magazines finished; 7 200-pounder Parrot rifle guns dismounted, and old 10-inch platforms and breast-height wall removed; center pintle platforms replaced with front pintle platforms. In extension—5 timber platforms removed; work on breast-height wall, bombproof shelter, and retaining wall. **75, 15.**

1876. Work on breast-height wall and platforms. In extension—work on breast-height wall, bombproof, and retaining wall, platforms. **76, 15.**

1877. Work on platforms and parapet. In the extension—work on the parapet; outer traverse rails laid on 5 15-inch gun-timber platforms; work on earthen slopes. **77, 12.**

1878. Repair of slopes, **78, 14.**

1879. 250 f. of fence built; repairs, **79, 18.**

1880-85. Care and preservation, **80, 31; 81, 30; 82, 27; 83, 24; 84, 28; 85, 21.**

1886. 2 wooden front pintle platforms for 8-inch converted rifles built and guns mounted, **86, 22.**

Staten Island—Fort Wadsworth (formerly Fort Richmond).

1847. Work begun, **80, 30.**

1866. Work on granite walls; 16 floor girders placed, filling carried up to the height of exterior walls; and ditch three-fourths excavated, **66, 10.**

1867. Guardhouse and 2 cisterns finished, ditch excavated, and 2 sluiceways completed, **67, 9.**

1869. 330 c. y. earth, washed from main slope into road, removed, **69, 12.**

1870-71. Repair of slopes in rear of work, **70, 19; 71, 14.**

1874. Replacing old pintles with new 4-inch ones in the 6-inch barbette guns' platforms, **74, 13.**

1875. \$5,000 appropriated; no work, **75, 13.**

1876. Torpedo work, and repair of storeroom roofs, **76, 14.**

1878. Painting ironwork in embrasures; minor work, **78, 13.**

1879. Wooden approach to drawbridge built; iron railing and portcullis painted; slopes repaired, **79, 16.**

1880-81. 10-inch S. B. guns on first tier replaced with 8-inch rifles, **80, 30; 81, 29.**

1882. Arch built over reservoir; repair of masonry of sea wall; stone steps built at the wharf; painting barbette railing, ironwork of embrasures, portcullis, etc.; 2 concrete shot beds built on parade, **82, 25.**

1883. Sea wall repaired; stationary part of drawbridge renewed; minor work, **83, 21.**

1884. Painting guardhouse and magazine roofs, **84, 26.**

1885. Replacing old pintles with new 4-inch pintles with keys; resodding revetment on top of breast-height wall, painting storeroom roof, etc.; minor repairs, **85, 19.**

1886. Repointing gun platforms and breast-height wall; and a rough low retaining wall built halfway down the long slope, **86, 20.**

Fort, Sandy Hook, N. J.

1857. Work begun. Importance. **80, 33.**

1866. Work on scarp and casemate arches of the water fronts, **66, 11.**

1867. Work on scarp of northeast bastion, piers of northwest front, walls of service magazines; excavation for foundations of scarp and piers of the new terrace; work on jetties, **67, 11.**

1868. Work on the southeast, south, and southwest land front; minor work; repair of jetties 1, 2, and 4; jetty 6 commenced; minor work, **68, 14.**

1869. Work on land fronts continued, **69, 14.**

NEW YORK HARBOR—Continued.

1870. Care and preservation, 70, 20.
1871. \$13,500 allotted; work on additional jetties, 71, 15.

1872. 2 jetties built of sheet piling, each 150 f. long, 72, 13.

1873. 2 jetties built, one of sheet piling and one of cedar piles and brush, 73, 12.

1874. One jetty 109 f. long built, 74, 15.

1875. Care and preservation, 75, 16.

1876-77. Repair of jetties, and plant, 76, 16; 77, 12.

1878. Sand box bulkhead 1,300 f. long built, 78, 15.

1883. \$17,500 allotted; 766 f. of concrete jetties built on the sites and remains of old jetties, 83, 26.

1885. \$5,000 allotted for stone revetment between jetties 8, 9, and 10; work completed; 57 shot beds made; repair of buildings, 85, 24.

Fort on site of Fort Tompkins.

1858. Work begun. Description, 80, 30.

1866. 14 platforms built; parapet and terreplein filled and sodded; barrette transverse magazine floors concreted; 9 casemate floor arches turned; work on lining casemates with brick; minor work, 66, 10.

1867. 5 casemates furred, 21 floored, and 9 fitted up for quarters; work on the road and repair of slopes; platforms for the guns on the four land fronts finished, 67, 9.

1868. Work on latrines and outlet drains and roads, etc., 68, 13.

1869. Drainage and repair of slopes, 69, 13.

1870. Repair of slopes; building a picket fence, 70, 19.

1871. \$52,000 appropriated. Constructing piers and arches of 17 bombproofs, and scarp wall between sally ports; work on parade wall, sewers, connecting cisterns, and minor work, 71, 14.

1872. \$83,000 appropriated. Completion of masonry of 2 gateways and 2 sally-port arches, walls and arches of passageways over sally ports; scarp wall north and south of sally port lowered 5 f. and coping relaid; granite parade wall nearly finished; mastic placed on casemates and sally-port arches; minor work, 72, 11.

1873. \$30,000 appropriated. Swamp filled in and drained; glacis north and northwest of fort graded; work on earth filling of cover face on channel front; earthwork of casemates, and masonry and earthwork of traverses between guns completed; minor work, 73, 11.

1874. \$30,000 appropriated. 10 timber platforms laid and masonry breast-

height wall built; completion of interior finish of casemate quarters in south half of work; drainage; magazine doors finished; minor work, 74, 13.

1875. \$20,000 appropriated. 8 casemates prepared for quarters; walk, drainage, and slope work, 75, 14.

1876. Covered reservoir built; latrine work; hanging doors; minor work, 76, 14.

1877. Repair of earthwork; minor repairs; estimates in detail for completion, 77, 11.

1878. Repair of slopes and roads; drainage, 78, 13.

1881. Casemate floors raised and casemates prepared for storage of torpedo cases, 81, 29.

1882-83. General preservation and repair, 82, 25; 83, 22.

1884. Repairing walls, parade ground, roads, and slopes, 84, 27.

1885. Bonnet on southeast angle of fort completed; 5 storm doors built; lamp closet fixtures supplied; repair of masonry of walls of ditch, roads, slopes; torpedoes painted, 85, 20.

1886. Pointing of masonry on scarp and counterscarp walls; painting torpedoes and exposed ironwork; repairing slopes; macadamized road leading from south sally port of the fort to light-house begun, 86, 21.

Staten Island.—South Cliff battery.

1858. Work begun. Importance, 80, 33.

1866. Slopes in rear of terreplein formed and sodded; north end battery finished; work on south end of battery, 66, 11.

1867. Main slopes completed; new magazine constructed; minor work, 67, 10.

1868. Work on roads, gutters, and slopes, 68, 14.

1869. Repair of slopes; platform 5, injured in experimental firing, repaired; estimate, proposed modifications, \$17,000, 69, 13.

1870. Platform damaged by experimental firing repaired; repair of parapet; sodding slopes, 70, 19.

1871. Slopes repaired and cesspools cleaned, 71, 5.

1873-74. Care and preservation, 73, 12; 74, 15.

1875. Bluestone revetment above breast-height wall and part of old armament removed preparatory to beginning modifications, 75, 15.

1876. Project modified. Work on traverse magazine front wall; removal of platforms; excavation for drains. Eight guns mounted, 76, 16.

1877. Estimate, completion, accord-

NEW YORK HARBOR—Continued.

ing to approved plans, \$37,100. Minor work, and repairs, 77, 12.

1878. Minor repair of slopes, etc., 78, 15.

1879. Repair of roof of traverse magazine and slopes, 79, 18.

1882. Retaining wall built near entrance to principal magazine; large slope in rear of battery repaired and regraded, 82, 29.

1883. Repair of slopes, 83, 25.

1884. Repair of doors, slopes, and gun platforms, etc. 84, 30.

1885. Replacing 5-inch pintles with new 6-inch pintles; placing 3 inner traverse circles; laying floor; painting doors; minor work, 85, 23.

1886. Repair of slopes, 86, 24.

Staten Island.—North Cliff battery.

1862. Work begun. Importance, 80, 32.

1866. Seven platforms for 15-inch guns and breast-height wall built; north traverse magazine built; drainage, embankment, and road making in progress, 66, 11.

1867. Completion of 5 platforms and breast-height wall; earth covering of north traverse finished, and the traverse completed; work on south end of battery; excavation for large magazine in north end of battery; some drainage, 67, 10.

1868. Principal magazine completed; work on filling above it; filling of parade in south end; work on parades, 68, 13.

1869. Work on entrance walls; clearing the terreplein and roads of the slope washings; minor work. Estimate, proposed modifications of battery for heavy guns, \$27,000. 69, 13.

1870-71. Slight repair of slopes, 70, 19; 71, 15.

1872. Masonry in principal, and 2 traverse magazines completed; work on wall of covered passage in solid traverse; removal of old breast-height wall and platforms of south end of battery, 72, 12.

1873. Earthwork and sodding over the 2 principal magazines completed; grading and sodding of large slope in rear completed; work on the additions to wing walls and earth cover of old traverse magazines and arch passageways, 73, 12.

1874. Foundations of 4 timber platforms, and platforms, laid; completion of additional masonry and earthwork to traverse magazines south of the north principal magazine, 74, 15.

1875. Two timber gun platforms laid; repair of earthwork, 75, 15.

1876. Slopes repaired, 76, 16.

1877. Estimate, modifications, \$34,700. Minor work and repairs, 77, 12.

1878. Stone drain 60 f. long built; work on slope, 78, 15.

1879. Work on slopes, 79, 18.

1881. Fifteen-inch gun from platform 1 dismantled and sent away, 81, 3.

1883. Repair of slopes, drains, etc., 83, 24.

1884. Repair of roads, drains, doors, and slopes, 84, 29.

1885. Replacing 5-inch pintles with new 6-inch pintles; work on doors, floors, and slopes, 85, 23.

1886. Repair of slopes, 86, 23.

Eastern Entrance.—Fort at Willets Point.

1863. Work begun. Importance, 80, 27.

1866. Drainpipes laid under casemate floors of first tier; flagging laid for casemate floors and for terreplein outside of casemates; embrasure iron put in place; work on scarp wall, flagging, and traverse stones, on drain gallery and cut stone; basin finished. Minor work, 66, 8.

1867. Work on scarp wall; completion of piers, casemate floors, second tier, northwest drain gallery; northeast drain gallery begun, 67, 8.

1868. Completion of arch over service magazine in second tier, and of drain gallery in rear of northeast retaining wall, arch over salient casemate and 2 flank casemates in channel bastion; excavation for storage magazine completed, 68, 11.

1869. Work on storage magazine; fitting up service magazine for storage of powder; care and preservation. Estimate earthen barbette battery for heavy guns, \$180,000. 69, 11.

1870. Work on storage magazine, breaking stone; drainage, 70, 17.

1871. \$45,000 appropriated. Underground passage 270 feet long from the new bluff batteries to the water battery completed. Work on large storage magazine, 6 service magazines, and parapet, covering emplacement for 12 heavy guns. Battery ready for guns. 71, 13.

1872. \$76,500 appropriated. Storage magazine completed; Little Bay battery (2 guns), and west battery (6 guns), with their 5 traverse magazines, essentially completed; excavation for mortar battery made; concrete stone prepared; extensive repairs of wharf, 72, 10.

1873. \$40,000 appropriated. West battery, with emplacements for 6 guns and 3 service magazines, completed, including most of its sea walls. Work on middle battery (10 guns), 4 guns could be mounted; east battery (7 guns) begun; mortar battery (16 heavy mortars) ready for mortars. 73, 10.

1874. West battery—work on concrete foundation for 1 15-inch front pintle gun platform and sea wall completed. Middle battery—3,000 c. y. earth placed in parapet; sodding exterior slopes com-

NEW YORK HARBOR—Continued.

pleted; platforms ready for 4 15-inch guns; sea wall completed; 4 storage casemates completed; minor work. East battery—6,000 c. y. earth placed in parapet; 1 traverse magazine built and covered with earth, 2 others built and partly embanked; mortar battery completed, and platforms nearly ready for mounting 4 13-inch mortars on hand. 74, 12.

1875. \$25,000 allotted. West battery—1 15-inch platform completed; sodding exterior slope. Middle battery—work on traverse circles; platforms for 2 15-inch guns completed and guns mounted; some sodding done; 3 storage casemates built; drainage and minor work. Mortar battery—4 wooden platforms for 13-inch mortars placed. 75, 121.

1876. Torpedo casemates prepared. Mortar battery—minor work on slopes, 2 new storage casemates finished, some drainage. Sea wall built in front of little battery. 76, 12.

1877. Sea wall extended; slopes repaired; storage casemates covered with earth; wharf strengthened, general repairs, 77, 9.

1878. Earth placed on parapet and storage casemates; sea wall extended 543 l. f.; and minor repairs, 78, 11.

1879. Repair of slopes, sea walls; earth covering of storage casemates; minor work, 79, 15.

1880-86. Care and preservation, 80, 26; 81, 27; 82, 22; 83, 17; 84, 23; 85, 16; 86, 17.

Governors Island.—Castle William.

1866. Steps of the towers repaired, 255 s. f. of flagging laid, 66, 9.

1867. Tower steps finished; renewing the 3 galleries of communication of the casemates; repairing magazine doors and buildings, etc., 67, 8.

1868. Repairing galleries, doors, and embrasure shutters; 10 casemates repaved; repairing mastic covering of terreplein, and minor work, 68, 12.

1869. Brick floors of ground tier relaid; repairing casemates of upper tier; galleries and railing of second and third tiers and terreplein of barbette tier and magazines repaired, 69, 12.

1870. Covering the terreplein with mastic, 70, 18.

Governors Island.—Fort Columbus.

1866. Flagging the walks of the parade; repairing the pump drain, and relaying the platform around the pump, 66, 9.

1867. Work on flagging the walks and curb of parade; removing old cobble stone covering of postern and ramp, and placing Belgian pavement; general repairs, and minor work, 67, 8.

1868. Pointing the scarp; relaying flagging; drainage work; repairing slopes, roads, and glacis, and minor work, 68, 11.

1869. Repairing glacis, slopes, roads, and banks, drawbridge, magazines; and minor repairs. Estimate, earthen battery for heavy guns, \$104,000. 69, 12.

1871. 8 traverse magazines built in new battery; work on parapet, excavation for the terreplein, road, and remaining 8 magazines, 71, 13.

1872. 6 shot beds built and 8 more begun; in new barbette battery 6 magazines coated outside with Portland cement; parapet completed, and terreplein reduced to proper level, 72, 10.

1873. 54 shot beds built, and 1,027 l. f. sea wall laid, 73, 10.

1874. Replacing draw floor in drawbridge, 74, 12.

1875. Repairing drains, 75, 12.

1876-77. Repairing drawbridge and wharf, 76, 13; 77, 9.

1878. Repairing slopes, etc., 78, 12.

Fort Hamilton and redoubt.

1866. Condition to be considered by a board of engineers, 66, 10.

1867. Embrasures cut down, and shot furnaces removed. Condition of work, 67, 9.

1868. Part of counterscarp wall rebuilt, over 2,000 f. of drain work completed; minor work on buildings, 68, 13.

1869. Altering embrasures on the east and north fronts; pointing scarp and counterscarp walls, and repairing slopes; and minor repairs, 69, 12.

1870-71. Repairs; and embrasures altered in officers' quarters, 70, 18; 71, 13.

Staten Island.—New casemated battery.

1866. Work on test boring; 3,993 c. y. of ashlar cut for foundation courses and casemate piers, and 4,919 c. f. of stone broken for concrete, 66, 11.

1867. Cutting stone in progress. Work on main battery proper not begun, 67, 10.

1868. Work on stone cutting; and construction of wharf, 68, 13.

1869. Work on wharf; and care and preservation, 69, 13.

1870. Unexpended balance transferred to fort on site of Fort Tompkins, 70, 20.

Governors Island.—South battery.

1867. Slight repair of scarp walls, 67, 8.

1868. Flagging of parade taken up and relaid; repair of sally port and drains, 68, 12.

1870. 150 f. dry stone sea wall built, 70, 18.

NEW YORK HARBOR—Continued.

1874. Extension of permanent drain to beach, 74, 12.

Staten Island.—*Glacis mortar battery (south of fort on site of Fort Tompkins).*

1871. Earthwork and sodding completed; 2 service magazines nearly completed, and granite coping laid on the entrance retaining walls; battery nearly completed, 71, 15.

1872. Battery completed, except hanging doors and laying platforms, 72, 12.

1873. Battery finished, except inner magazine doors and lamp closets, 73, 12.

1874. Armament mounted. Work on magazine doors and lamp closets, 74, 14.

1875. Work on lamp closets, etc., 75, 14.

1876-79. Slopes repaired, 76, 15; 77, 11; 78, 14; 79, 17.

1880. Importance of battery, 80, 34.

1885. Principal magazine floored, slopes repaired, and minor work done, 85, 21.

1886. Repair of slopes and painting doors, 86, 22.

Staten Island.—*South mortar battery (in rear of Battery Hudson extension).*

1872. Work begun; importance of battery, 80, 32.

1873. Masonry and earthwork of south branch, and concrete foundations for 4 platforms completed, 73, 12.

1874. Work on magazine doors and picket fence, 74, 15.

1885. Painting doors and repairing slopes, 85, 22.

1886. Repair of slopes, 86, 23.

Staten Island.—*Glacis gun battery (on site of Fort Tompkins).*

1872. Work begun and battery finished, except hanging doors and laying breast height wall and timber platforms, 72, 12.

1873. Battery completed and made ready for armament, 73, 10.

1874. Magazine doors and lamp closet not yet completed, 74, 14.

1875. Minor work done on doors, slopes, etc., 75, 14.

1878-79. Minor repair of slopes, 78, 14; 79, 17.

1880. Importance of battery, 80, 31.

1885. Northservice magazine floored, doors completed and hung; top revetment over breast height wall resodded; and minor work, 85, 21.

1886. Repairing slopes and painting doors, 86, 22.

Governors Island.—*New barbette battery at Fort Columbus.*

1875. Repair of magazine doors; surface drain and 8 temporary magazine doors built, 75, 12.

Staten Island.—*Two-gun battery (near southeast angle of channel front of fort on site of Fort Tompkins).*

1883. Description. Built toward the close of the civil war. 83, 26.

1884-86. Repair of slopes, 84, 30; 85, 24; 86, 24.

Southern entrance.—*Mortar battery 1, with ditch defenses, Sandy Hook defenses.*

1890. \$201,000 allotted. Work begun in Nov., 1890. 93, 600.

1891. 30,000 c. y. excavated, 91, 7.

1892. 13,025 c. y. concrete placed, 92, 6.

1893. \$53,000 allotted. 13,827 c. y. concrete masonry built and 118,478 c. y. sand filling placed; drainage system completed, and four carriages received, 93, 600.

1894. \$20,000 allotted. Masonry and sand filling completed; mortar platforms built and carriages assembled, and mortars mounted and tested. 94, 449.

1895. Final battery firing made; results shown. Project for electric-lighting system approved and installed; description, with cost. Report by Col. H. C. Abbot upon volley practice with mortars. 95, 8, 505, 519.

1896. Overhead traveler for handling ammunition adjusted; minor repairs to embankment and repainting doors, 96, 480.

1897. Total cost of battery, \$270,-724.67, 97, 618.

1898. 8 platforms dismantled and provided with index rings of the new pattern, 98, 631.

1899. 8 more platforms dismantled and provided with new index rings. A pier built for emergency range finder. 99, 778.

1900. Alterations completed, 1900, 839.

Eastern entrance.—*Battery for sixteen 12-inch mortars.*

1891. 400 c. y. rock, and 1,600 c. y. earth removed, 91, 7.

1892. Buildings erected and wharf built; 7,379 c. y. earth excavated and 3,462 c. y. placed in embankment, 92, 7.

1893. 1,939 c. y. rock removed; 2,166 c. y. earth excavated and placed in embankment; 1,860 c. y. of stone crushed, and 1,952 yards of concrete laid, 93, 8.

1894. 4 platforms in progress, and

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anchoring bolts set; filling one-half completed; 4 carriages on hand, 94, 9.

1895. 4 carriages and mortars mounted in one pit; excavation of 3 other pits completed; 4 mortars and carriages on hand; floors placed in magazines, loading rooms, and one-half of galleries, 95, 8.

1896. \$32,106.79 allotted for battery, and \$2,085.87 allotted for mounting guns and carriages; all platforms completed; 8 mortars and carriages received and mounted; work on retaining walls and embankment, 96, 473.

1897. \$9,700 allotted. Concrete slopes and pavements completed, embankment nearly finished, all carriages and mortars mounted and turned over to the troops. \$5,200 allotted for electric-light-plant building; completed. 97, 610.

1898. \$5,500 allotted for construction of parapet and one emplacement for 8-inch B. L. rifle; earth parapet and magazines built, 98, 624.

1899. \$8,150 allotted. Platforms altered for new type of azimuth circle. 8-inch B. L. rifle mounted on altered 15-inch S. B. carriage. Supplies purchased for electric plant. Improving drainage completed. 99, 762.

1900. New azimuth circles received and set, 1900, 828.

Eastern entrance.—Five-gun battery (Staten Island).

1891. 16,620 c. y. excavated and placed in embankment, 91, 7.

1892. 8,485 c. y. concrete placed; minor work, 92, 5.

1893. Concrete work, and earth parapet nearly completed; terreplein roughly graded; ditch excavated and paved, and rear earth slope graded, 93, 7.

1894. Minor work done; awaiting the adoption of a gun carriage, 94, 8.

1895. 968 c. y. of earth placed in parapet; masonry of fifth emplacement and of 4 platforms well advanced, 95, 7, 504.

1896. Concrete and earth work completed. 5 guns and carriages received and mounted; latrines built, range-finder and relocater house built; battery completed except hoists, trolley, cranes, hand rails, and lights. Battery transferred to commanding officer of the post. 96, 477.

1897. Hand rails placed; cranes, trolleys, and hoists erected; battery now complete, 97, 613.

1898. Painting superior slope concrete, 98, 629.

1899. Minor repairs, 99, 773.

Eastern entrance.—Gun battery (south side of entrance).

1891. Excavation for 1 magazine for 8-inch guns and its approaches completed and concrete work begun, 91, 7.

1892. 1 magazine and part of parapet connecting it with next emplacement completed, and the second magazine begun, 92, 6.

1893. 10,093 c. y. concrete placed, 10,628 c. y. earth excavated, and 4,384 c. y. placed in embankment; and minor work, 93, 8.

1894. Work completed as far as possible; awaiting adoption of carriage, 94, 9.

1895. Wharf repaired, 95, 8.

1896. \$20,540 allotted; 1 10-inch emplacement completed, including mounting of carriage and gun. Work on the other emplacement. 96, 475.

1897. \$45,000 allotted. Another emplacement, No. 6, authorized April 22. Minor work and installation of trolleys—hoists and cranes for first 3 emplacements; 55 t. of granite and iron placed on gun platforms for settlement. Three 15-inch Rodman guns dismounted from site of emplacement 6; work begun. 97, 612.

1898. Emplacements 1, 2, and 3 completed; emplacement 6, concrete work finished and earth work nearly completed; ammunition lift, trolley, and cranes in place. \$5,600 allotted for waterproofing. \$100,000 allotted for 2 12-inch gun emplacements 4 and 5; excavation begun. 98, 626.

1899. Excavation for emplacements 4 and 5 completed; concrete work nearly finished, 99, 765.

1900. Emplacements 4 and 5 nearly completed; guns mounted. Emplacement 6—rear roadway graded and side banks sodded. 1900, 830.

Southern entrance.—Gun-lift battery 1, Sandy Hook defenses.

1891. \$9,087.43 appropriated. Excavation begun and nearly completed; 3,500 c. y. concrete placed; foundation for accumulator pit, 5 f. below water, laid; and minor work. 91, 7.

1892. \$53,912.57 appropriated; 29,875 c. y. concrete placed; mechanism placed. Estimate, battery for 2 12-inch guns, \$457,000. 92, 6.

1893. \$458,500 allotted (1891-93). Estimates of cost. 8,292 c. y. masonry constructed; 5,185 c. y. sand placed in embankment, gun mounted and tested, and battery practically completed. 93, 607.

NEW YORK HARBOR—Continued.

1894. Ammunition service completed, bullet-proof entrance doors completed and hung, gun tested, **94**, 456.

1895. Second gun mounted, completing this battery; final drawing of completed battery made. Cost of construction. **95**, 8, 506.

1896. History; cost and estimates. Rapidity of fire tested by Board of Engineers; results. Preservation and repair. **96**, 480.

1897. Description of battery; construction, expenses and testing guns, and mechanism. **97**, 619.

1898. Condenser for disposing of exhaust steam installed. 2 range-finder pipes for portable instruments built. **98**, 631.

1899. 3 Gatling guns mounted for gorge defense; alterations made in pillars for emergency range finders, **99**, 778.

Southern entrance—Seven-gun battery, Long Island.

1893. \$82,000 allotted. Work begun; 2,700 c. y. earth removed; construction plant nearly completed. **93**, 7.

1894. 10,867 c. y. earth excavated and 10,362 c. y. concrete placed, **94**, 456.

1895. Pavement on superior slope nearly completed; drainage system put in; doors made and hung, and casemates prepared for R. F. guns. Table of cost of work. **95**, 7, 505.

1896. \$72,600 allotted. Emplacements completed, awaiting arrival of carriage. Revised plans. **96**, 479.

1897. \$45,000 allotted. Projects. Work on modification of 4 traverse magazines for 6-pounder R. F. guns; ammunition service and electric-light plant installed. **97**, 614.

1898. \$100,000 allotted. Emplacements 4, 5, 6, and 7 completed; guns mounted and turned over to the commanding officer; work on emplacements 1, 2, and 3 begun, and platforms for 2 and 3 completed. **98**, 627.

1899. Emplacements 1, 2, and 3 completed, and 3 carriages and 1 gun mounted. Cost of work. **99**, 768.

1900. 2 remaining guns mounted, and galleries connecting loading platforms built, **1900**, 833.

Eastern entrance—Platforms for target practice.

1896. Platforms for 2 practice guns—one for 15-inch S. B. front pintle and one for 8-inch converted rifle completed; entire cost, \$1,950, **96**, 474.

1900. Earthen barbette and temporary magazines built, **1900**, 828.

Eastern entrance—Emplacement 1, for 12-inch rifle, disappearing carriage (north side of entrance).

1897. \$50,000 allotted. Supplies purchased; railroad from wharf to site of battery nearly finished. **97**, 611.

1898. Concrete work of the parapet, platform, and magazines, and the earthwork of the parapet completed; cranes and trolley for handling ammunition set up, **98**, 625.

1899. Earthwork completed, machinery and electric lights installed, carriage and gun mounted, and emplacement completed. Electric plant installed, brick wall built at foot of slope, and drain put in. **99**, 763.

Eastern entrance—Two emplacements for 10-inch rifles on disappearing carriages (north side of entrance).

1897. Work begun in Aug., 1896. Wharf built and concrete plant set up. Excavation and embankment mainly done by contract. Platforms ready for the carriages. **97**, 611.

1898. 2,864 c. y. concrete placed. Guns and carriages mounted and battery completed, except minor work. Battery turned over to the commanding officer May 5, 1897. \$75 allotted for introduction of water supply. **98**, 625.

1899. Water-supply system and electric lights installed, **99**, 763.

Eastern entrance—Mortar battery for 8 12-inch modern mortars (south side of entrance).

1897. \$14,000 allotted. Plans for 8 platforms prepared. Cut stone ordered and excavation for drains begun. **97**, 612.

1898. \$3,000 allotted. Platforms built and mortars and carriages mounted. **98**, 626.

1899. Shot-trolley service installed, **99**, 766.

Eastern entrance.—Two 2-gun batteries for 10-inch guns (Staten Island).

1897. Work begun in July, 1896, on 2 batteries, each with 2 positions for 10-inch rifles. Platforms ready for carriages by December, 1896; parapet and magazines completed; 1 carriage being assembled. Artillery fire control—work begun on stations for range finder, observation, and searchlight. **97**, 613.

1898. Ammunition lifts, trolley, and cranes provided; magazine doors hung; superior slopes painted; 4 telephone booths built, and electric-light plant installed. Batteries turned over to the commanding officer. **98**, 629.

NEW YORK HARBOR—Continued.

1899. Minor repair of ammunition lifts and drainage system, **99**, 773.

Southern entrance.—Battery of three 10-inch and four 12-inch guns (Staten Island).

1897. Work begun by contract on emplacements for three 10-inch guns on disappearing carriages. Excavation and concrete work; 2 emplacements for 12-inch guns to be built by hired labor. **97**, 622, 623.

1898. Three 10-inch emplacements adopted in lieu of 1 of the originally proposed 2 iron casemates; battery completed under contract. Work begun on 12-inch emplacements. 9,732 c. y. concrete placed, magazines built, and 2 platforms ready for armament; work begun on the other 2 emplacements. **98**, 631, 632.

1899. Electric plant installed at 10-inch emplacement, completing same; 12-inch emplacement nearly completed; 2 guns and carriages received. Cost of work. **99**, 778, 779.

1900. Four 12-inch guns mounted; some waterproofing, **1900**, 839.

Southern entrance.—Five-inch rapid-fire battery (Sandy Hook defenses).

1897. \$4,000 allotted for 1 emplacement, **97**, 623.

1898. Work begun in September, 1897, and completed April 21, 1898, **98**, 632.

1899. Alteration of platforms completed, and gun mounted, **99**, 779.

1900. Alteration of platform made, **1900**, 839.

Southern entrance.—Ten-inch battery (Sandy Hook).

1897. \$100,000 allotted for 1 battery of 2 10-inch guns. Work begun, 1876. Battery completed, except ammunition lifts. No carriages received. **97**, 620.

1898. 2 emplacements built on site originally proposed for a second gun-lift battery; ammunition lifts erected, electric lighting completed, and the battery turned over to the commanding officer, **98**, 631.

1899. Doors repaired; 2 concrete pillars built for emergency range finders, **99**, 778.

Eastern entrance.—Two emplacements for 5-inch R. F. guns (south side of entrance).

1898. \$9,000 allotted; work begun; platforms and magazine walls completed, **98**, 626.

1899. Change in carriages necessitating change in platforms, completed; battery completed in May, 1899, **99**, 766.

1900. Slopes graded and sodded; electric wires placed; carriages received but not assembled, **1900**, 830.

Southern entrance.—Mortar battery, 12-inch mortars (Long Island).

1898. Plans being prepared, **98**, 627.

1899. Work begun and excavation in progress, **99**, 771.

1900. 8,562 c. y. concrete placed; base rings for platforms set; work on parapet and slopes, **1900**, 832.

Southern entrance.—Rapid-fire guns (Long Island).

1898. \$6,000 allotted for 2 4.7-inch R. F. guns; platforms 7 and 8 of 15-inch gun battery (water battery) altered for the rapid-fire guns; emplacement completed and guns mounted, **98**, 627.

1899. Drains cleaned, **99**, 77.

Southern entrance.—12-inch battery No. 1 (Long Island).

1898. \$80,000 allotted from "National defense" for 2 barbette emplacements. Excavation in progress. Allotment from "Gun and mortar batteries" for 12-inch emplacements for disappearing carriages. **98**, 627.

1899. Emplacements 1 and 2 completed. Mounting carriages; cost of work. Allotment for emplacements 3 and 4, for 2 12-inch B. L. rifles on disappearing carriages. Work begun in Aug., 1898. Excavation completed and concrete work in progress. Cost of work. **99**, 770.

1900. 7,489 c. y. masonry placed, completing concrete work. Battery nearly completed, guns mounted at 1 and 2, and carriages in 3 and 4. \$5,000 allotted for raising 2 12-inch delivery tables to adapt them to ammunition trucks issued by Ordnance Department. **1900**, 833.

Eastern entrance.—Rapid-fire guns (Staten Island).

1898. \$6,000 allotted for 2 emplacements for 4.7-inch guns to protect mine fields; work begun; platforms completed; guns mounted; emplacements completed except minor work, **99**, 629.

Eastern entrance.—Temporary batteries, Staten Island.

1898. \$5,000 allotted. Work begun in May for battery for 3 8-inch converted rifles; platforms, sand parapet, and magazines completed; battery ready for armament. **98**, 629.

Eastern entrance.—Twelve-inch emplacement, Battery Hudson (Staten Island).

1898. Excavation begun for 2 emplacements for 12-inch guns on disap-

NEW YORK HARBOR—Continued.

pearing carriages, L. F. model 1896, 98, 829.

1899. Magazines and platforms nearly completed; carriages received. Cost of work. Arrangement of plant shown on tracing. Range-finder house built. 99, 766, 774.

1900. Emplacements completed, except small amount of sodding on slopes; armament being mounted, 1900, 836.

Eastern entrance.—Twelve-inch emplacement, Battery Richmond (Staten Island).

1898. Allotment from "National defense" for 2 emplacements, excavations nearly completed; platforms ready for armament; parapet and walls built to level of magazine ceilings, 98, 629.

1899. Battery completed; machinery and lights installed; one base ring set. Range-finder house built. Cost of work. 99, 773.

Eastern entrance.—Two emplacements for 8-inch B. L. rifles on modified 15-inch gun carriages (Staten Island).

1898. \$6,000 allotted. No alteration required for platforms and magazines of old battery; one altered carriage nearly completed. 98, 629.

1899. Work completed; guns received and mounted in August, 99, 775.

Southern entrance.—Pneumatic gun battery (Sandy Hook defenses).

1898. Emplacements for 2 15-inch and 1 8-inch gun to be built by contract. Sand parapet, built of sand-bag retaining walls, nearly completed. 98, 632.

1899. Sand-bag retaining walls completed. Pillar erected for an emergency range finder. 99, 779. Board walk built to connect with 10-inch battery, No. 2. 99, 780.

1900. Concrete retaining walls and bombproof begun, 1900, 839.

Southern entrance.—Six-inch rapid-fire battery (Sandy Hook defenses).

1898. \$16,000 allotted. Plans approved and railroad track to site of battery built. 98, 632.

1899. One-third concrete work completed. Site interfered with ordnance proving ground; work suspended. 99, 779.

Eastern entrance.—Emplacement No. 2 for 12-inch rifle (north side of eastern entrance).

1899. Work begun in July, 1898. Platform completed. 99, 763.

1900. Emplacement completed, except sodding. Carriage and gun mounted. 1900, 829.

Eastern entrance.—Two emplacements for 5-inch R. F. guns (north side of eastern entrance).

1899. Work begun in Aug., 1899, and completed, awaiting arrival of carriages, 99, 764.

1900. Carriages received, base rings set, platforms paved, and roadway graded. Guns not received, 1900, 829.

Eastern entrance.—Two emplacements for 15-pounder R. F. guns (north side of eastern entrance).

1899. Work begun in Apr.; magazines completed, 99, 764.

1900. Emplacements completed; guns not mounted. 184 c. y. concrete laid, and 2,040 c. y. embankment built. 1900, 829.

Eastern entrance.—Two emplacements for 15-pounder R. F. guns (south side of eastern entrance).

1899. Work begun in Feb., excavations completed, drains installed, and 258 c. y. concrete placed, 99, 756.

1900. Emplacements completed and armed. Waterproofing. 1900, 831.

Southern entrance.—Twelve-inch battery in Stone Fort, Long Island.

1899. Plans approved for 2 12-inch B. L. rifles on disappearing carriages on the water face of the old stone fort, 99, 770.

1900. 5,998 c. y. of old masonry removed, 3,712 c. y. excavated, and 2,745 c. y. concrete placed, 1900, 833.

Southern entrance.—Six-inch battery, Long Island.

1899. Plans approved for 2 emplacements for 6-inch B. L. rifles on disappearing carriages, 99, 771.

1900. 3,604 c. y. old masonry removed, 2,121 c. y. excavated, and minor work, 1900, 833.

Southern entrance.—Two 15-pounder R. F. guns, Long Island.

1899. Two 8-inch converted rifles dismantled from platforms 1 and 2 of old water battery, and work begun on new work; 290 c. y. earth excavated, 99, 771.

1900. 659 c. y. concrete placed, 532 c. y. earth excavated, 400 c. y. placed in slopes; work nearly completed, ready for its armament, 1900, 832.

Eastern entrance.—Two emplacements for 6-inch guns on disappearing carriages (Staten Island).

1899. Work begun in March. Emplacement 2 nearly completed; cost of work. 99, 774.

NEW YORK HARBOR—Continued.

1900. Emplacements nearly completed, except a small amount of parapet construction, **1900**, 836.

Eastern entrance—Two emplacements for 15-pounder R. F. guns (Staten Island).

1899. Work begun in Feb. and completed in June, 1899, **99**, 775.

Eastern entrance—Two emplacements for 6-inch R. F. guns on pedestal mounts (Staten Island).

1899. Work begun in Sept., 1898; concrete work completed, and guns mounted in Dec., **99**, 775.

Southern entrance—15-pounder R. F. emplacement, Sandy Hook.

1899. Work begun in Feb. for 2 emplacements, and completed; awaiting arrival of carriages, **99**, 780.

1900. Carriages not yet received, **1900**, 839.

Eastern entrance—Two emplacements for 5-inch R. F. guns.

1900. \$20,000 allotted; work begun in Aug., 1899, emplacements nearly completed; magazines covered with asphalt waterproof course; cost of work, **1900**, 828.

Southern entrance—Two additional emplacements for 15-pounder R. F. guns.

1900. Allotment made and work begun, **1900**, 840.

Preservation and repair of fortifications.

1897. \$2,000 allotted for eastern entrance. Repairing sea wall and wharf, **97**, 612.

Southern entrance to harbor: Roof of torpedo shed repaired, and ironwork painted. Cost, \$240.97. \$790 allotted for gun-lift battery. **97**, 623.

1898. Eastern entrance: \$2,561.58 allotted for electric supplies and correction of defective drainage in mortar battery; \$350 allotted for repair of gallery and for platform for 8-inch converted rifle, **98**, 625. \$1,550 allotted; 1,493 c. y. riprap placed along base of sea wall; wharf, buildings, and sewers repaired, **98**, 626.

Southern entrance: Sea wall in front of 10-inch battery repaired, and platforms 3, 4, 5, and 6 of water battery altered for 8-inch converted rifles; carriages and guns mounted, and slopes repaired and sodded, **98**, 628.

Staten Island: \$4,945 allotted, repairs to old forts, sea walls, manholes in sewer; iron fence built; 5 15-inch gun platforms

altered to adapt them to carriages for 8-inch converted rifles, **98**, 630.

Sandy Hook: Ironwork and doors of mortar battery painted, and slopes repaired, electric wiring removed from wooden conduits and placed in iron pipes; minor work and repairs at gun-lift battery, **98**, 632.

1899. North side of eastern entrance: Searchlight installed. South side of eastern entrance: Wharf repaired; waterproofing and drainage of disappearing-gun battery. **99**, 766.

Southern entrance: Repair of electric plant; drainage surfaces of platforms of 10-inch guns and superior slope repaired, **99**, 77.

Staten Island: Old forts and new works repaired, **99**, 776.

Sandy Hook: Batteries and buildings repaired, **99**, 780.

1900. Eastern entrance: \$284.80 allotted, storm doors built; minor work, **1900**, 878.

North side of eastern entrance: \$200 allotted for repair of searchlight, and constructing shelter. \$700 allotted for waterproofing magazines, and for minor repairs. **1900**, 829.

Long Island: \$1,700 allotted; minor repairs of slopes, cranes, hoists, pavements, drainage, etc., **1900**, 834.

Staten Island: \$2,814 allotted. Repair of lifts, concrete platforms, drainage, mining material, etc. **1900**, 838.

Sandy Hook: \$4,546.70 allotted. Roendale cement pavement over magazine replaced with Portland. Sand slopes of mortar battery regraded to a slope of 1 upon 2; minor repair of other batteries. **1900**, 840.

Range and position finders.

Eastern entrance, **96**, 477; **97**, 613.

Artillery fire control, **97**, 613; **98**, 629; **99**, 776.

Four range-finder houses built and turned over to the Board on Regulation of Seacoast Artillery Fire, **98**, 630, 631; **99**, 776.

Southern entrance to harbor, **99**, 771, 779.

Sandy Hook, **99**, 780; **1900**, 840.

North side of eastern entrance; 2 stations built, **1900**, 829.

Long Island: 2 stations built and turned over to the commanding officer, **1900**, 833.

Sea walls and embankments.

Bedloes Island (eastern entrance):

Estimated cost of 580 l. f. of new sea wall, \$25,000, **94**, 14; **96**, 478.

David's Island (eastern entrance):

Slight repairs, **94**, 14.

Repairs made to riprap and coping, and

NEW YORK HARBOR—Continued.

750 c. y. riprap placed back of wall, 96, 477.

\$47,000 allotted for sea wall and earth embankment. Plans. Work begun in May; 4,046 tons of riprap placed, and 625 c. y. of embankment placed, 89, 458. 5,022 t. of riprap, and all capping placed, completing the wall; 27,650 c. y. of material placed in embankment, nearly completing contract, 90, 382. 3,555 c. y. of earth placed in embankment, completing same. Survey made 1891, 91, 521. Report of a survey made of Davids Island, by Col. Houston; with design for construction of a sea wall. 92, 460.

Fort Schuyler (eastern entrance):

Repairs, 86, 17. \$4,225 allotted for repairs; completed, 96, 477; 97, 611; 98, 625. \$2,400 allotted for protection of shore north of barracks, 99, 764. \$10,000 allotted for sea wall on the north shore of reservation. 1900, 830.

Governors Island (southern entrance):

107 c. y. of cut stone, 172 c. y. of concrete foundations, and 162 c. y. of concrete backing laid in sea wall; 47 f. of coping placed, 66, 9. \$54,000 appropriated. Project of 1865 provided for inclosing the entire island with a sea wall 1,750 f. long, 8 f. high. Work begun in May, 1883, to complete sea wall; 300 l. f. built, work done by contract. 83, 19, 385. \$500 allotted; 206 f. of wall built, 84, 25; 86, 18. \$50,000 allotted, 1888. Plans. Foundation completed for 261 f. from the Castle William wall; 180 f. of cut stone wall built. 89, 460. 319 c. y. of concrete foundation, and 1,421 c. y. of masonry wall laid; 21,447 c. y. of earth placed in embankment, 90, 384. \$50,000 appropriated. History of work. 144 c. y. concrete foundation placed and 153 l. f. masonry wall built. 91, 525. \$6,597.86 transferred from Davids Island. Total of work done to date—659 c. y. of concrete foundation, and 1,499 l. f. of masonry wall laid; 1,856 c. y. of embankment placed behind north wall, and 39,544 c. y. behind west wall; description of sea walls around entire island, 92, 461. \$4,000 transferred from Davids Island. 396 l. f. wall built, 685 c. y. riprap placed, and minor work, 93, 631. Riprapping completed, pointing of masonry finished, embankment back of west sea wall protected with broken stone for a width of 12 f.; project completed, 94, 14.

Sandy Hook (southern entrance):

\$7,500 allotted. Sea wall to protect pneumatic guns completed in 1894. 4,546 t. of stone placed, cost, \$5,298.03, 96, 483. \$75,000 appropriated. Violent storm, 1897, broke through sand pit of Hook and closed up channel of Shrewsbury River, threatening the only land communication

with the fortifications at Sandy Hook. Riprap wall to close the breach built under contract; 57,165 t. of riprap placed, 98, 633.

Sites.*Coney Island:*

After examination, new site selected, 92, 9

Plumb Island:

50 acres acquired by condemnation proceedings; \$99,547.76 paid, 92, 9.

Fort Hamilton:

56.54 acres acquired by condemnation proceedings; \$302,768.13 entire cost, 92, 9. Act of State legislature; land acquired adjacent to reservation ceded to United States, 93, 10.

Baysia. (near Keansburg), N. J.:

25.3 acres purchased for \$200 an acre, 92, 9.

Staten Island:

Tract No. 1 of the King property purchased for \$60,000, 98, 630. Site purchased for \$51,000 in 1898, 99, 776. \$95,000 allotted for purchase of 3 tracts of land; proceedings instituted, 1900, 838.

Fort Wadsworth, west of:

14 acres purchased for \$110,000. Condemnation proceedings instituted for acquisition of 115 acres, 92, 9. 82 acres acquired by condemnation proceedings; price, \$599,497.30, 93, 10. 6½ acres purchased for \$53,680, 95, 504.

Sandy Hook, N. J.:

28 acres acquired at cost of \$25,000, 93, 11.

Submarine mines.

1891. 9,000 allotted. 5 mining casemates completed, 91, 7.

1892. 2 special storage sheds completed, 92, 9.

1893. Description of torpedo shed, 93, 617; 94, 456.

1894. Torpedo shed completed; cost, \$3,323.51, 94, 447.

1898. Southern entrance to harbor; \$30,000 allotted.

Staten Island: Mining casemate, torpedo storehouse, and tank built in 1897; oil engine installed in casemate; water supply introduced and a passage opened from the casemates to the channel; movable hoist and traveling crane set up; minor work. \$23,250 allotted for planting mines, 98, 628.

Sandy Hook: 2 storage tanks constructed by remodeling 2 cisterns in the old stone fort; mines planted, 2 searchlights installed, 1 5-inch siege rifle, 1 7-inch siege howitzer, and 1 4.7-inch R. F. gun mounted on temporary emplacements, 98, 632.

NEW YORK HARBOR—Continued.

Eastern entrance to harbor: Description of mines placed, 98, 635.

1899. South side of eastern entrance: Mining casemate built, 99, 766.

Eastern entrance: All torpedo defense removed from mine fields; mines exploded; second mining casemate built and turned over to the commanding officer, 99, 767.

Southern entrance: Supplies for electric lighting and searchlights purchased, 99, 771.

Staten Island: Mines and cables taken up, cleaned, and stored; 2 additional cable tanks built, 99, 773.

1900. Defenses of the Narrows: Mines and cables taken up, cleaned, and stored; 2 mines lost; repair of electric plant.

Sandy Hook: 2 cable tanks built; cranes installed, and cable stored; new water tank built; casemates wood-lined and waterproofed; mines taken up, cleaned, and stored.

North side of eastern entrance: Searchlights to be reassembled and sent to one of the service schools, 99, 829.

Staten Island: Electric conduit system laid to connect battery commanders' and fire commanders' stations; reassembling portable searchlight outfits, 1900, 836.

Sandy Hook: \$3,000 allotted for reassembling portable searchlights; stored cable overhauled and examined; repairs to instruments made, 1900, 840.

NEW YORK AT OLD BRUNSWICK, CAPE FEAR RIVER. (See *North Carolina.*)**NIAGARA RIVER.** (See *Lake ports.*)**Engineers.**

CHIEF OF ENGINEERS. Reports, 66, 3; 67, 3; 68, 6; 70, 11; 71, 6; 72, 3; 73, 4; 74, 6; 75, 5; 76, 6; 77, 4; 78, 6; 79, 8; 80, 18; 81, 15; 82, 10; 83, 6; 84, 11; 85, 6; 86, 6.

ENGINEERS IN CHARGE:

Capt. and Maj. J. A. Tardy, 1866-67.

Col. T. J. Cram, 1868.

Maj. F. Harwood, 1868-74.

Lt. Col. C. E. Blunt, 1875-78.

Maj. W. McFarland, 1878-83.

Lt. Col. H. M. Robert, 1883-84.

Capt. E. Maguire, 1884-86.

Forts and batteries.—Operations.

Fort Porter, Black Rock, near Buffalo, N. Y.

1842. Work begun, 80, 18.

1867-68. Two temporary buildings (storerooms) repaired, 67, 3; 68, 6.

1871. Projects for repair prepared, 71, 6.

1873-77. Act of July 11, 1870, authorized the Buffalo Park commissioners to beautify the grounds; work in progress, 73, 4; 74, 6; 75, 5; 76, 6; 77, 4.

1881. Keep nearly destroyed by fire many years previous, and the entire work in its existing condition useless for offense or defense, 81, 15.

1885. Park commissioners built a roadway, by permission of Secretary of War, April 12, 1884, through the reservation, cutting the rampart of the fort, necessitating the tearing down of the west angle, including the hot-shot furnace and the river face. A wooden fence was built along this face. 85, 6.

NIAGARA RIVER (mouth), FORT NIAGARA, N. Y. (See *Lake ports.*)**Engineers.**

CHIEF OF ENGINEERS. Reports, 66, 3; 67, 3; 68, 6; 69, 7; 70, 11; 71, 6; 72, 4; 73, 5; 74, 6; 75, 5; 76, 7; 77, 4; 78, 6; 79, 8; 80, 18; 81, 15; 82, 10; 83, 6; 84, 11; 85, 6; 86, 6; 87, 4; 90, 5; 91, 8; 92, 12; 93, 11; 96, 527; 97, 20, 743; 98, 29, 773; 99, 33, 974; 1900, 30, 973.

ENGINEERS IN CHARGE:

Capt. J. A. Tardy, 1866-67.

Col. T. J. Cram, 1867-68.

Lt. Col. C. E. Blunt, 1868-69.

Maj. M. D. McAlester, 1869.

Maj. N. Bowen, 1869-71.

Lt. B. D. Greene, 1871.

Maj. J. M. Wilson, 1871-76.

Maj. W. McFarland, 1876-83.

Lt. Col. H. M. Robert, 1883-84.

Capt. E. Maguire, 1884-86.

Maj. M. B. Adams, 1890-91.

Capt. D. C. Kingman, 1890-93. Reports, 91, 517; 92, 453; 93, 625.

Maj. W. S. Stanton, 1896-98. Report, 96, 527.

Lt. Col. A. M. Miller, 1898.

Maj. T. W. Symons, 1899-1900.

Capt. G. D. Fitch, 1899-1900.

NIAGARA RIVER (mouth), FORT NIAGARA, N. Y.—Continued.

Forts and batteries.—Operations.

1839. Work begun. The work contains two masonry blockhouses, built by the French about 1757, and other buildings begun by the French and finished by the English after its capture by them during the French and Indian war. 80, 18; 81, 15.

1866. Replacing the old wooden scarp of land fronts with masonry, 66, 3.

1867. Constructing casemates, and some minor work, 67, 3.

1868. Sally-port arch and land-front arch completed, and the dry-stone wall partly finished, 68, 7.

1869. Casemate arches finished; entrance to flank casemate completed; rampart and parapet extended to scarp wall; all dry-stone filling behind walls finished, 69, 7.

1870. Arched passage to the flank gallery backed with concrete, covered with mastic, and parapet formed over it; paved drains behind open scarp wall of the entire land front completed; and minor work, 70, 11.

1871. Terreplein and parapet of the north and south bastions raised, graded, and sodded; building wooden platform for 4½-inch rifled gun; and minor work, 71, 6.

1872. Repairing and pointing scarp wall; constructing sewer and drains in main ditch and grading and seeding same; paving postern road and casemates; repairing sea wall; and minor work, 72, 4.

1873. Crib-work protection at westerly angle of fort; jetties on lake front constructed; postern gates made and hung; and minor work, 73, 5.

1874-75. Care and preservation, 74, 6; 75, 5.

1876. Main approach, damaged by water, being repaired, 76, 7.

1877. New road built to the fort, 77, 4.

1878. Damaged masonry of the salient of south bastion rebuilt, 78, 6.

1882. Jetties repaired, 82, 10.

Preservation and repair.

1890-91. \$10,000 allotted. Repairs to lake-front revetment; crib-work base for northwest angle of the breakwater completed; cofferdam built and northwest angle of fort wall rebuilt. 91, 519.

1898. 1,850 feet of Niagara River bank seeded, 98, 774.

1899. Bank repaired and seeded, 99, 974.

1900. Concrete breakwater repaired; and bank repaired, sodded, and seeded, 1900, 973.

Sea walls and embankments.

1890. \$20,000 allotted, 1888, for preservation. Work delayed until Aug. 10, 1889, by stage of water in the lake; 1,811 l. f. shore revetment built; breach in work being closed. 90, 5.

1891. \$10,000 allotted. Project for protection of site of Fort Niagara. Wall at northwest angle repaired, and some dike built. 91, 518.

1892. Sea wall completed, and 941 l. f. of bank graded, 92, 454.

1893. Retaining wall repaired, and tile laid for draining slope, 93, 626.

1896. Estimated cost of protecting 650 f. of bank in front of the officers' quarters, \$7,000, 96, 527.

1897. Lake wall repointed, stones relaid, and 80 f. of its foundation protected with riprap. River bank surveyed. 97, 743.

1898. 1,850 f. of Niagara River bank sloped, graded, and protected with brush fascines and stone ballast. Project of 1888 completed. 98, 774.

NORTH CAROLINA.

Contracts.

1897. Emplacements for 3 8-inch guns, \$66,631.45 for 2; itemized cost, 97, 671.

1899. Mixing and placing concrete, \$1.20 per c. y., 99, 856.

Engineering features.

Cable tank, description and cost, 99, 858.

Carriages, releiving, 1900, 904.

Concrete forms, 99, 851.

Concrete, wet and dry, 1900, 906.

Cracks caused by settlement of battery, method of repairing, 99, 859.

Drainage system, 1900, 910.

Electric plant, description and cost, 99, 849.

Guns, moving and mounting, and cost, 99, 853.

Leakage, prevention of, 1900, 898, 908.

Masonry, composition of, 99, 852.

Materials, quantity and cost of, 97, 674; 98, 695; 99, 852, 856; 1900, 906.

Plant, description and cost, 97, 673; 99, 851, 852, 856; 1900, 908.

Storehouse, torpedo, description and cost, 99, 858.

Waterproofing, 1900, 898.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 14; 69, 16; 70, 22; 71, 19; 72, 15; 73, 17; 74, 20; 75, 20; 76, 21; 77, 17; 78, 21; 79, 25; 80, 41; 81, 41; 82, 38; 83, 35; 84, 40; 85, 33; 86, 33; 95, 10; 96, 17,

NORTH CAROLINA—Continued.

501; 97, 16, 670; 98, 24, 692; 99, 25, 845; 1900, 23, 897.

BOARD OF ENGINEERS. Constituted, 1882, to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with. Report, 82, 422.

ENGINEERS IN CHARGE:

Col. Q. A. Gillmore, 1870-86.
Capt. J. Mercer, 1883-84.
Capt. J. C. Post, 1883.
Capt. F. A. Hinman, 1884-85.
Capt. W. H. Bixby, 1885-86.
Maj. W. S. Stanton, 1895-96.
Lt. Col. D. P. Heap, 1896-97.
Capt. W. E. Craighill, 1897-99.
Capt. E. W. Van C. Lucas, 1899-1900.

ASSISTANTS:

Lt. E. W. Van C. Lucas, 1895.
Lt. E. Jadwin, 1896-98.
Lt. J. C. Oaks, 1898-99. Report, 98, 695.
Lt. E. I. Brown, 1899-1900.

Forts and batteries.—Operations.*Fort Macon, Beaufort Harbor.*

1896. Work begun, 80, 41.

1866. Question of modifications to be placed before the Board of Engineers, 66, 14.

1870. Modification plans under consideration, 70, 22.

1871. Timber wharf, and jetty to protect same, built; cost, \$4,779, 71, 19.

1872-73. Work on wharf, and breakwater under wharf, 72, 16; 73, 17.

1874. Jetty and cribwork built west of wharf, 74, 20.

1875. Timber cribwork and breakwater completed (severe storm destroyed part of these works), 75, 20.

1876-78. Subject of modification still under consideration, 76, 21; 77, 17; 78, 21.

1879. Bridge across ditch repaired and new wooden covers placed over the ventilation of all casemates, 79, 25.

1880-82. Board sand-catch built to restore the beach to its former area and height. Results satisfactory, 80, 41; 81, 41; 82, 38.

1883. Parapet and glacis cleared, and fence and jetties repaired, 83, 35.

1884. Work continued on jetties, 84, 40.

1885-86. Care and preservation. Summary of repairs. 85, 34; 86, 33.

^a List of works as arranged under this head—

Fort Macon, Beaufort Harbor.
Fort Caswell, Cape Fear River.
Old Brunswick, new work at.
Cape Fear River.—Emplacements for four 8-inch guns.
Beaufort Harbor.—Defenses at entrance.

Fort Caswell, Cape Fear River.

1896. Work begun, 80, 42.

1866. Question of modification to be placed before Board of Engineers, 66, 41.

1870-86. Importance of fort. Modification plans under consideration. 70, 22; 71, 19; 72, 16; 73, 17; 74, 20; 75, 21; 76, 22; 77, 18; 78, 21; 79, 25; 80, 42; 81, 42; 82, 39; 83, 35; 84, 41; 85, 34; 86, 34.

New work at Old Brunswick, Cape Fear River.

1872. Plans and estimates being prepared, 72, 16.

Mouth of Cape Fear River.—Emplacements for four 8-inch guns.

1897. \$127,900 allotted. Work begun under contract for 3 emplacements. 2,966 c. y. concrete and 2,286 c. y. sand for embankment placed. Work given in detail with cost. 97, 670, 672.

1898. \$43,000 allotted; 3 emplacements completed and guns and carriages mounted. Work begun on fourth emplacement Mar. 18, completed; and gun and carriage mounted by May 12. Battery completed except railings, trolleys, etc. 98, 693.

1899. \$2,000 allotted for installing storage battery. Battery completed. Repairs of electric wiring, drainage system, and filling of cracks caused by unequal settlement of battery with asphalt dissolved in naphtha; cistern cleaned and trees planted; traverse circle of gun No. 4 releveled. 99, 858.

1900. Releveling carriages; new drainage system laid; and slopes from terreplein to floors repaired by removing the turving and covering the slopes with a layer of concrete 4 inches thick, 1900, 904.

Beaufort Harbor.—Defense at entrance.

1898. \$3,000 allotted. Carriages of 2 100-pounder Parrott rifles put in good order, and 1 of the guns moved to a new and more advantageous position. Two 10-inch S. B. mortars mounted on covered way and a magazine arranged for them. Two platforms for the same mortars were also arranged on the parade. Splinter-proof traverses built for the protection of guns and mortars. 98, 692.

1899. Minor work done to complete

List of works as arranged under this head—Cont'd.

Fort Johnson.—Reservation at Southport.
Two emplacements for 12-inch B. L. rifles.
Two emplacements, 4.72-inch and 5-inch guns.
Mortar battery for eight 12-inch mortars.
Emplacements for two 5-inch R. F. guns.

NORTH CAROLINA—Continued.

the placing of the 100-pounder Parrott rifles and 2 10-inch S. B. mortars, 99, 846.

Reservation at Southport (Fort Johnson).

1898. Repair of building on reservation. Proceedings instituted for possession of the reservation by parties claiming to have acquired rights to the property. 98, 693.

1899-1900. Suits for possession of reservation still pending, 99, 946; 1900, 897.

Two emplacements for 12-inch B. L. rifles on nondisappearing carriages.

1898. \$90,000 allotted. Work begun on platforms May 11, and completed May 27; excavation completed, and 4,070 c. y. concrete placed; wharf strengthened for unloading guns. 98, 693, 696, 697.

1899. \$38,325 allotted. Guns and carriages mounted and battery completed. Description and detailed cost of work. 99, 852, 854.

1900. Repair of drains. 1900, 905.

Two emplacements, one for 4.72 R. F. gun, and one for 5-inch R. F. gun.

1898. \$3,000 allotted for mounting guns. The 5-inch emplacement incorporated in the fourth emplacement for 8-inch B. L. rifle and completed when that emplacement was finished. The 4.72-inch R. F. emplacement was built on parapet of the old fort; work completed; no guns received. 98, 696.

1899. \$3,000 allotted. Guns mounted and all work completed; turned over to the garrison, 99, 26, 854.

1900. \$600 allotted for installing ammunition lift in 4.72-inch emplacement; lift purchased and installed; description and tracing, 1900, 897, 898, 905.

Mortar battery for eight 12-inch steel mortars.

1899. \$112,000 allotted. Work begun in Aug., 1898; masonry completed; floors laid; trolleys placed; 29,000 c. y. sand placed in parapet, and 1,801 s. y. sod placed; 4 mortar pits finished; 7 carriages and 8 mortars received; \$2,120 allotted for mounting; in progress. Itemized cost of work. 99, 854, 856.

1900. All guns mounted and battery completed, except installing electric-firing apparatus; construction work, with cost, in detail; description of wet and dry concrete; foundations for mortars; cracks, methods of filling; plant and materials; drainage system; electric lighting, and damage done by storm of Oct. 30, 1899. 1900, 905-910.

Emplacements for two 5-inch R. F. guns.

1899. \$10,500 allotted. Work begun in 1898 on 1 emplacement. Concrete placed by contract. Wagon road built to connect with mortar battery; masonry and all other work completed; awaiting arrival of carriage. Itemized cost of the emplacements. 99, 856.

1900. Parapet restored at cost of \$425. No armament as yet. 1900, 897, 911.

Miscellaneous.*Electric plant.*

1899. Located in casemate of old fort. Description of plant, with tabulated statement of cost of installation. 99, 849.

Preservation and repair of fortifications.

1899. General repair of 8-inch emplacement, 99, 858.

1900. \$2,225 allotted. Releveling 8-inch gun carriages and repair of drainage of 8-inch and 12-inch emplacements. 1900, 904.

Sea wall and embankment.*Fort Caswell, N. C.*

\$150,000 appropriated May 25, 1900. Violent storm occurred Oct. 30 and 31, 1899. Report submitted by Capt. Lucas, describing the storm and damages caused by it, with plans and estimates of cost and repairs. Project submitted. 1900, 900.

Submarine mines.

1895. \$7,000 allotted, 1894, for mining casemate and cable gallery; work begun, 95, 10.

1896. \$2,000 allotted, both completed. Total cost, \$8,361.98; detailed cost of work. 96, 17, 501.

1898. \$10,600 allotted. Torpedo casemate fitted up with operating apparatus; torpedoes planted. Telephone and telegraph connections made with Wilmington, N. C., and minor work. 98, 695, 697.

1899. \$2,900 allotted for removing mines, caring for same, and altering mining casemate; mines removed, cleaned, and stored, 99, 848. \$1,250 allotted for cable tank which was completed; cable stored; description; itemized cost, 99, 848, 857. \$6,500 allotted for torpedo storehouse; completed, fireproof, and lighted by electricity; description and itemized cost. 98, 848, 858.

NORTH CLIFF BATTERY. (See *New York Harbor.*)**OGLETHORPE.** (See *Georgia.*)**ONTARIO.** (See *Lake ports.*)**OSWEGO, FORT ONTARIO, N. Y.** (See *Lake ports.*)**Engineers.**

CHIEF OF ENGINEERS. Reports, 66, 3; 67, 3; 68, 7; 69, 7; 70, 12; 71, 6; 72, 4; 73, 5; 74, 6; 75, 5; 76, 7; 77, 5; 78, 6; 79, 8; 80, 18; 81, 16; 82, 11; 83, 6; 84, 12; 85, 6; 86, 7.

ENGINEERS IN CHARGE:

Lt. Col. C. E. Blunt, 1866-69.
Maj. M. D. McAlester, 1869.
Maj. N. Bowen, 1869-71.
Lt. B. D. Greene, 1871.
Maj. J. M. Wilson, 1871-76.
Maj. W. McFarland, 1876-83.
Lt. Col. H. M. Robert, 1883-85.
Capt. E. Maguire, 1885-86.

Ports and batteries. — Operations.

1839. Work begun, 80, 19.

1863-66. Replacing the timber revetments with masonry; scarp wall raised 3 f.; constructing flank casemates, 66, 3.

1867. Raising scarp wall in progress; masonry of gateway, postern arch, and casemates of left flank completed, 67, 3.

1868. Raising scarp wall; masonry of 2 guardhouses completed; roof surfaces on front 4 finished and covered with mastic, and parapet of the curtain and flanks embanked, 68, 7.

1869. Work on scarp wall, 69, 7.

1870. Masonry of left flank commenced and completed; masonry of right flank in progress; coping laid and backed with concrete on the adjoining face; scarp of both faces raised, and minor work done, 70, 12.

1871. Gallery in right flank of bastion E nearly completed, scarp wall of bastion E completed; building dry walls in the galleries and under the back of stairways; parapets of right and left faces sodded; terreplein graded, and minor work, 71, 7.

1872. Gallery in right flank of bastion E completed; gallery in left flank of bastion A continued; connection of gallery to proposed magazine; and parapet on fronts 5 and 3 formed and sodded, 72, 4.

1873-78. Care and preservation, 73, 5; 74, 6; 75, 6; 76, 7; 77, 5; 78, 7.

1879. Minor repairs. Estimated cost of completion, \$119,975. 79, 9.

1880. Four pent houses built over the entrances to the flank casemates and scarp galleries of bastion D and E; and entrance to unfinished gallery planked up, 80, 19.

1881. Work in an unfinished state, 81, 16.

1882. Work turned over to the Engineer Department for repairs. No work to be done at once. 82, 11.

1883. New York, Ontario & Western R. R. authorized to lay 3 tracks across the reservation, 83, 7.

1884. Timber revetment repaired; some minor repairs made, 84, 12.

1885. Revetment repaired, 85, 6.

1886. Revetment and drain ditches repaired, 86, 7.

PENOBSCOT RIVER, ME. (See *Maine coast.*)**PENSACOLA, FLA.****Contracts.**

1898. Natural cement, 95 cents per barrel. Electric plant for mortar battery, \$6,474. 98, 730.

1899. Gravel, \$1.70 per c. y. Natural cement, \$1.55 per barrel. Portland cement, \$2.25 and \$2.55 per barrel. Gravel, \$2.20 per c. y. 99, 915, 916.

Engineering features.

Bins, storage; description and cost, 97, 716.

Concrete, cost per c. y. in place, 97, 719; 98, 727; 99, 919.

Derrick system, description, 99, 920.

Forms, concrete; cost, 97, 717.

Labor, distribution and itemized cost, 98, 733; 99, 919.

Materials, description, with quantities and itemized cost, 98, 726, 733; 99, 915, 916, 917, 920.

Mixer, description and cost, 97, 716.

Plant, cost, 97, 718.

Plant, description of, 98, 726; 99, 920.

Railroad, 3-f. gauge, description and itemized cost, 97, 715.

Waterproofing, method of, 98, 727; 99, 916, 922; 1900, 940, 941, 942.

Water supply, cost, 97, 717.

Wharf, description of, and itemized cost, 97, 715.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 15; 67, 13; 68, 17; 69, 17; 70, 25; 71, 21; 72, 19; 73, 20; 74, 24; 75, 24; 76, 25; 77, 20;

PENSACOLA, FLA.—Continued.

78, 24; 79, 28; 80, 46; 81, 46; 82, 44; 83, 41; 84, 46; 85, 39; 86, 40; 94, 10; 95, 11; 96, 18, 518; 97, 18, 714; 98, 27, 725; 99, 30, 914; 1900, 26, 939.

BOARD OF ENGINEERS. Constituted, 1882, to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with, 82, 425.

ENGINEERS IN CHARGE.

Capt. J. C. Palfrey, 1866.
Capt. W. E. Merrill, 1866.
Maj. M. C. McAlester, 1866-68.
Maj. F. E. Prime, 1868-69.
Capt. A. N. Damrell, 1869-70.
Maj. C. B. Reese, 1871.
Col. J. H. Simpson, 1871-73.
Lt. Col. W. F. Reynolds, 1873.
Maj. A. N. Damrell, 1873-85.
Capt. R. L. Hoxie, 1885-86.
Capt. P. M. Price, 1894.
Maj. F. A. Mahan, 1894-99.
Capt. C. A. F. Flagler, 1899-1900.

ASSISTANTS:

Lt. C. Keller, 1895.
Lt. C. P. Echols, 1895-96.
Lt. J. P. Jervay, 1896-99. Report, 97, 714.
Lt. L. H. Rand, 1899-1900.

Fort and batteries.^a — Operations.

Fort Pickens.

1828. Work begun, 80, 46.
1866. One front pintle barbette gun platform for modern armament and one for projectile built; repairs and modifications of the parapet of west bastion, 66, 15.
1868. Wharf rebuilt; drains, road and pavement of terreplein repaired, removing sand and traverses in south bastion and uncovering casemate arches of southwest bastion for foundation of 15-inch gun platform, 68, 17.
1869. Road completed; gun platform in west bastion prepared and gun mounted; work on platform for a large gun in southwest bastion; wooden platforms for projectiles built; general repairs and minor work, 69, 17.
1870. Modification plans being prepared, 70, 25.
1871. General repairs of wharf, storehouses, etc., 71, 21.
1872. Magazine doors repaired, 72, 19.
1873. Care and preservation, 73, 20.

^a List of works as arranged under this head—
Fort Pickens.
Fort McCre.
Fort Barrancas and redoubt, including old Spanish fort.
Battery for four 10-inch guns.

1874. Repair of cisterns, magazine doors and buildings; 4 4-inch front pintle masonry platforms with low traverse stones and 2 of the same with high traverse stones, built for ordnance on hand, and 2 more with low traverse stones nearly completed; minor work, 74, 24.

1875. \$25,000 appropriated, 75, 24.

1876. Necessary buildings repaired and new ones built, R. R. track laid, cars and derricks made; modifications of bastion C nearly completed, and work begun on bastion D, 76, 25.

1877. Bastion D completed; repairs to terreplein, stairs, bermes, etc., 77, 20.

1878. Repair of wharf and buildings, 78, 24; 79, 28.

1880. History of fort; care and preservation, 80, 46; 83, 41; 86, 40.

Fort McRee.

1836. Work begun, 80, 47.

1873. Care and preservation, 73, 20.

1874. Site undermined by action of sea; scarp fallen, leaving casemates open. Modification plans for barbette batteries for heavy guns and a mortar battery, to take the place of the old work. 74, 25.

1875. Modification plans approved for 4 batteries for heavy guns, and 1 mortar battery, 75, 24.

1878. All property of value transferred to Fort Pickens, 78, 24.

1880. History of fort, 80, 47.

Fort Barrancas and Redoubt, including the old Spanish fort.

1839. Work begun, 80, 46.

1866. Condition of work, 66, 15.

1868. Breast height walls of the main work and of the redoubt repaired, and parapets regaded and sodded; necessary repairs of foundation of southwest angle of counterscarp wall; southern extremity of glacis and ditch graded and sodded; gates made and hung; and work on fence around reservation begun, 68, 17.

1869. Fence around work completed, bridges repaired, grating and ventilators placed in magazines; and minor work, 69, 17.

1870. Modification plans being prepared, 70, 21.

1873. Magazine doors built, 73, 20.

1874. Preparations for constructing platforms in progress, 74, 25.

1875-78. Care and preservation, 75, 24; 76, 25; 77, 21; 78, 24.

List of works as arranged under this head—
Mortar battery for eight 12-inch mortars.
Battery for two 4.7-inch R. F. guns.
Battery for two 12-inch guns.
Battery for two 8-inch guns.
Battery for four 15-pounder R. F. guns.

PENSACOLA, FLA.—Continued.

1880. History of fort, **80**, 46.

1881-82. Work on fence around fort and redoubt, **81**, 47; **82**, 45.

1883-86. Care and preservation, **83**, 41; **84**, 47; **85**, 40; **86**, 40.

Battery for four 10-inch guns.

1895. \$100,000 allotted. Survey made, **95**, 11.

1896. \$60,000 allotted. Work begun, wharf built, and construction plant in progress. Description of wharf, **96**, 518.

1897. \$31,500 allotted. Concreting begun Nov. 1, 1896, and completed Mar. 29, 1897. Sand filling completed. Battery practically completed, ready for armament. Summary of work with itemized cost, **97**, 714.

1898. Electric-light plant installed, 4 guns and carriages mounted, and battery turned over to the troops. Itemized cost of work, **98**, 726.

1899. Road built along rear of battery, **99**, 914.

1900. \$2,300 allotted for improving the cramped condition of the electric-light plant, involving the construction of two additional rooms, removing the sand covering, and improving the ventilation. Work begun, **1900**, 939.

Mortar battery for eight 12-inch mortars.

1898. \$121,000 allotted. Work begun in Aug., 1897. Concrete work begun in Feb. and completed on May 31, 1898. 9,700 c. y. placed. Description of construction plant, materials, and actual work, with itemized cost. 3 carriages in position, **98**, 726.

1899. \$2,250 allotted. Battery completed, mortar carriages mounted. 12,000 c. y. sand filling placed, electric-light plant installed, 2 observation stations with stairways of concrete and steel built. Completed battery turned over to the artillery June 30, 1899. **99**, 914.

1900. The 8 mortars received mounted by the artillery, **1900**, 939.

Battery for two 4.7-inch R. F. guns.

1898. \$6,000 allotted. Work begun; concrete mixed by hand and placed with wheelbarrows. Battery completed and guns mounted. Description of work with itemized cost, **98**, 732.

1899. Some sand filling placed; hanging doors and building a chert road in rear. Battery turned over to the artillery in Oct., 1898. **99**, 918.

Battery for two 12-inch guns on disappearing carriages.

1898. \$50,000 allotted. Concrete in 1 emplacement completed; and in second emplacement platform and foundations

finished. Summary of work with cost **98**, 732.

1899. \$28,865 allotted. 13,770 c. y. sand filling placed, completing same, and a total of 9,400 c. y. concrete placed. Electric-light plant installed; ammunition conveyors, ladders, doors, etc., placed. Guns and carriages received and the work of mounting same begun. Battery turned over to the artillery June 30, 1899. **99**, 916.

1900. Carriages and guns mounted by the artillery, **1900**, 940.

Battery for two 8-inch guns on disappearing carriages.

1898. \$199,750 allotted. Work begun, wharf completed, concrete foundation of magazines and passages completed, and all preliminaries finished. **98**, 735.

1899. \$23,824 allotted. Battery completed, carriages mounted, electric plant installed; hand ammunition hoists, trolley ammunition conveyors and cranes placed. Summary of work with itemized cost. Tracing showing derrick system. **99**, 918.

1900. Guns received and mounted, and battery turned over to the artillery March 21, 1900, **1900**, 941.

Battery for four 15-pounder R. F. guns.

1899. \$20,230 allotted. Work begun Mar. 16, 1899. 777 c. y. concrete placed and 3,197 c. y. sand placed for filling. **99**, 915.

1900. \$14.58 allotted. Concrete work completed. 1,243 c. y. placed, and 5,696 c. y. of sand filling placed, completing same. Magazine roofs asphalted. No armament received. **1900**, 940.

Preservation and repair.

1897. \$1,820 allotted; 3 concrete platforms with granite pintle blocks for 8-inch converted rifles built to replace 3 timber platforms, which were rotten. Ammunition conveyors repainted. **97**, 721.

1898. \$2,225 allotted for repair of old works; 2 casemates and officers' quarters repaired; loading platforms of 15-inch S. B. guns renewed; 2 shot beds made; the old Spanish fort thoroughly overhauled and restored as far as possible, **98**, 736.

1899. \$10,143 allotted; magazines of 10-inch battery asphalted; minor repair of old forts and slopes of new works, **99**, 922.

1900. \$4,910 allotted; repair of wharf, slopes, magazine doors. Waterproofing magazines and dynamo room; mounting guns; repairs of breast-height wall at Fort Barrancas, and minor work. **1900**, 941.

PENSACOLA, FLA.—Continued.

Range and position finders.

1899. 2 observation stations built, 99, 914.

Sea walls and embankments.

Fort McRee.

Work on jetty in front of fort, 82, 45.

Submarine mines.

1894. One mining casemate completed; cost, \$8,012.39 94, 10.

1899. \$9,000 allotted. Mines planted, and removed by exploding them; doorway cut through the masonry into the adjoining casemate of a fort, and a blower added to improve ventilation; both casemates ceiled with flooring to prevent dampness. One casemate demolished by

explosion, June 20; torpedo storehouse built of brick, slate roof, and a traveling crane, where nearly all torpedo material was stored, was completely demolished by explosion; a building erected by contractor was bought for \$200, repaired, and fitted up as a loading room for submarine mines. This building was demolished by the explosion of June 20. 99, 922. \$1,000 allotted for operating searchlights; materials bought, 99, 923.

1900. \$8,040 allotted, mining casemate, torpedo storehouse, and cable tank injured by the explosion of June 20, 1899, repaired. One searchlight plant transferred to the artillery, and the other plant, injured by the explosion of June 20, 1899, repaired. 1900, 943.

PHILADELPHIA. (See *Delaware River.*)

General description of the defenses and the necessity for them, 73, 13.

PHOENIX. (See *Massachusetts.*)

PICKENS. (See *Pensacola.*)

PICKNEY. (See *South Carolina.*)

PIKE. (See *New Orleans, La., etc.*)

PLYMOUTH HARBOR. (See *Fort Sandish, Boston Harbor, Mass.*)

POINT. (See *Fort Point, San Francisco, Cal.*)

POINT JOSE. (See *San Francisco, Cal.*)

POINT LOBOS. (See *San Francisco, Cal.*)

POPHAM. (See *Maine Coast.*)

PORTLAND HARBOR. (See *Maine Coast.*)

PORTLAND HEAD. (See *Maine Coast.*)

PORT ROYAL, S. C. (See *South Carolina.*)

PORTSMOUTH HARBOR, N. H.

Contracts.

1897. 2 8-inch gun emplacements, \$55,372.52, 97, 599.

1900. Portland "Atlas" cement, \$2.24 per barrel, 1900, 769.

Engineering features.

Concrete, mixing and placing, 1900, 770.

Employees, distribution of, 1900, 772.

Plant, cost of, 1900, 772.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 5; 67, 5; 68, 9; 69, 9; 70, 14; 71, 9; 72,

6; 73, 6; 74, 8; 75, 7; 76, 8; 77, 6; 78, 8; 79, 11; 80, 21; 81, 19; 82, 14; 83, 10; 84, 16; 85, 10; 86, 10; 94, 13; 95, 6; 96, 12; 97, 12, 597; 98, 15, 591; 99, 17, 708; 1900, 14, 768.

BOARD OF ENGINEERS. Constituted, 1882, to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with. Report, 82, 416.

ENGINEERS IN CHARGE:

Lt. Col. J. N. Macomb, 1866.

Lt. Col. Z. B. Tower, 1867.

PORTSMOUTH HARBOR, N. H.—Continued.

Lt. Col. J. G. Foster, 1867-71.
 Lt. Col. J. C. Duane, 1871-79.
 Col. C. E. Blunt, 1879-86.
 Maj. J. A. Smith, 1886.
 Lt. Col. A. N. Damrell, 1897.
 Maj. R. L. Hoxie, 1897-99.
 Maj. S. W. Roessler, 1899-1900.
 Maj. W. L. Fisk, 1900.

ASSISTANTS:

Lt. G. P. Howell, 1897-99.
 Lt. C. Keller, 1899.
 Lt. T. H. Jackson, 1899-1900.
 Capt. C. Keller, 1900.

Forts and batteries.^a—Operations.*Fort McClary (Kittery Point, Me.).*

1863. Original work begun early in century; inclosed barbette work begun in 1863, 80, 21.

1866. 147 l. f. coping laid on south, southeast, and east walls; work on west scarp; terreplein excavated, 66, 5.

1867. Work on scarp wall; ditch excavation, 67, 5.

1868. Excavation for ditches completed; work on scarp on west front and northwest caponniere; minor work, 68, 9.

1869-73. Care and preservation, 69, 9; 70, 14; 71, 9; 72, 6; 73, 6.

1874. Three temporary wooden platforms for heavy guns nearly completed, 74, 8.

1875. Roadway repaired, 75, 7.

1876-86. Care and preservation, 76, 8; 77, 6; 78, 8; 79, 11; 80, 21; 81, 19; 82, 15; 83, 10; 84, 16; 85, 10; 86, 10.

1898. \$2,400 allotted for preservation and repairs. Three 15-inch guns mounted on temporary wooden platforms. 98, 587.

1899. Project contemplates the use of the existing armament and the mounting of the 15-inch guns pending construction of modern batteries, 99, 708.

1900. Repairing engine house to store mining material, 1900, 773.

Fort Constitution.

1866. Work on north scarp; eastern part of old fort demolished and debris removed; foundation of new work in progress. South front, 1 pier and 6 embrasures built and flagging laid for 9 casemates. 66, 5.

1867. Work on scrap wall; constructing embrasures, and laying flagging, 67, 5.

^a List of works as arranged under this head—
 Fort McClary.
 Fort Constitution.
 Barbette battery at Gerrish Island.
 Barbette battery at Jerrys Point.

1868-71. Care and preservation, 68, 9; 69, 9; 70, 14; 71, 9.

1872. Earthen barbette battery for 14 guns in rear of the partially casemated work; estimate, \$83,500, 72, 6.

1874. Temporary position for one heavy gun prepared, and platform partly laid, 74, 8.

1875-86. Care and preservation, 75, 7; 76, 9; 77, 6; 78, 8; 79, 11; 80, 22; 81, 19; 82, 15; 83, 10; 84, 16; 85, 10; 86, 11.

1900. Old building removed; improving ventilation of magazines, 1900, 773.

Barbette battery at Gerrish Island, Me.

1872. Project, 12-gun battery; estimate, \$45,200, 72, 6.

1873. \$25,000 appropriated. Parapet embankment; building concrete magazines. 73, 7.

1874. \$15,000 appropriated. Work on parapet, roadway in rear of terrepleins and 2 traverse; magazines. 74, 8.

1875. \$10,000 appropriated. Foundations for all traverse magazines prepared. 75, 8.

1876. Five breast-height walls finished; gun platforms built, 76, 9.

1877-78. Care and preservation, 77, 6; 78, 8.

1879. Plans for completion approved; partly executed, 79, 11.

1884. Plans require revision, 84, 16.

Barbette battery at Jerrys Point.

1872. Project, 12-gun battery; estimate, \$48,824, 72, 6.

1873. \$25,000 appropriated. Work begun, parapet embankment and building concrete magazines. 73, 7.

1874. \$15,000 appropriated. Raising parapet embankment; excavation for foundations of all traverse magazines completed. 74, 8.

1875. \$10,000 appropriated. Traverse magazines built; 3 breast-height walls completed; work on parapet embankment; mine work. 75, 8.

1876. Two traverse magazines built, foundation of another laid, and over 2,000 c. y. of embankment made, 76, 9.

1877-78. Care and preservation, 77, 7; 78, 8.

1879. Plans for completion approved; partly executed, 79, 11.

1884. Plans require revision, 84, 17.

1885. Placing woodwork in traverse

List of works as arranged under this head—Cont'd
 Two 8-inch gun emplacements.
 Two 8-inch B. L. rifles.
 Three emplacements for 10-inch guns.

PORTSMOUTH HARBOR, N. H.—Continued.

magazines to make them serviceable, 85, 10.

1896. Platforms ready for 15-inch guns; earthwork incomplete, 86, 11.

Two 8-inch gun emplacements.

1897. \$53,150 allotted. Emplacements to be built by contract (\$55,372.52). Excavations in progress. 97, 597.

1898. \$800 allotted for repair of buildings. Guns mounted; work nearly completed. 98, 591.

1899. \$16,000 allotted. Battery completed under contract; cost, \$61,936.21. \$500 allotted for repairs of road and buildings. 99, 703.

1900. Electric plant installed; turned over to artillery for use and care, 1900, 768.

Two 8-inch B. L. R. guns mounted on strengthened barbette carriages for 15-inch S. B. guns.

1898. \$6,000 allotted. Work begun; carriages received and mounted, awaiting guns. 98, 592.

1899. Guns mounted, 99, 708.

1900. Guns dismounted and shipped elsewhere, 1900, 15.

Three emplacements for 10-inch guns on disappearing carriages.

1899. \$146,000 allotted. Work begun; excavation in progress. 99, 704.

1900. Excavations completed; concrete floors and parapet of one emplacement completed to height of loading platform, and floors of second emplacement completed; 3 carriages received, 1900, 769.

Sites.

Fort McClary Reservation, Me.

By act of Jan. 23, 1893, part of the reservation exchanged for other land; sites transferred by deed, 94, 13; 95, 6.

Submarine mines.

1897. \$1,000 allotted, 97, 598.

1898. \$23,300 allotted in connection with defense of Maine coast; placing mines in harbor, 98, 592.

1899. \$5,633.60 allotted. Mining casemate completed. 99, 703. Mines removed from harbor, 99, 709.

1900. \$2,800 allotted for cable tank, which was completed; traveling crane installed; overhauling search-light plant, 1900, 773.

POST OF FORT TOTTEN, N. Y.—U. S. ENGINEER SCHOOL—BATTALION OF ENGINEERS—ENGINEER DEPOT.

Contracts.

1897. 30 miles of single-conductor cable and 9 miles 7-core cable, \$24,916.50; 26 rotary transformers, \$3,965.52; 26 oil engines, complete, \$17,316; 26 electric storage batteries, complete, \$7,384; 28 switchboards, complete, \$6,867.84, 98, 576.

1898. 46 operating boxes, complete, \$1,297.20, 98, 576; 25 miles multiple cable, \$47,500; 100 miles single cable, \$36,500; 75 miles single cable, \$26,212.50; 100 miles multiple cable, \$159,500; 1,600 torpedoes, complete, \$180,000; 7 wooden pontoon boats, complete, \$1,372; 1 fireproof instrument repair shop, \$7,550, 99, 682.

1899. 6 yawl boats, complete, \$702; white-pine lumber for bridge equipage, \$1,333.47; 18 wooden pontoon boats, complete, \$4,050; 2 frame storage sheds, \$745 each, 99, 683. Repairs to wharf, \$2,560.75. 1900, 1068.

1900. 50,000 brass washers, 78 cents per pound; compound plugs and glands, \$1,689.66; 12,000 fuses, 8 cents; 8,000 7-inch and 4,000 9-inch wire cut-outs, 6 cents; 1,050 aluminum metal cases, \$2.10; 66,000 f. No. 16 kerite insulated wire, \$11.50, and 26,400 f. No. 12, \$23.50 per 1,000 f.; 5 slow-speed rotary transformers, \$174 each; 6 oil engines, 4 horsepower, \$660; 6 electric switchboards, \$380; 500

thermometers, 66 cents; 100 hygrometers, \$2.45; 18,138 f. B. M. Oregon white-pine timber, \$50 per M; 200 500-pound anchors, \$1,290; 400 cut-out boxes, \$760; 7,500 split keys for shackles, \$45; 1,100 split keys for mines, \$49.50; 1,700 mine and 2,600 anchor shackles and 3,500 mooring sockets at 60 cents each, 1900, 1068.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, ii, 19; 67, 15; 68, 21; 69, 20; 70, 28; 71, 26; 72, 26; 73, 27; 74, 32; 75, 33, 131; 76, 32, 122; 77, 28; 78, 32; 79, 39; 80, 60; 81, 61; 82, 61; 83, 56; 84, 65; 85, 52; 86, 52; 87, 12; 88, 8; 89, 12; 90, 10; 91, 15; 92, 19; 93, 17; 94, 17; 95, 18; 96, 6; 97, 4; 98, 5; 99, 5, 8; 1900, 35, 36.

OFFICERS IN CHARGE:

Capt. F. Harwood, 1866.

Lt. Col. H. L. Abbot, 1866-85. Reports, 80, 297; 81, 419; 82, 443; 83, 389; 84, 425; 85, 425.

Lt. Col. J. C. Duane, 1868.

Lt. Col. C. B. Comstock, 1866-. Report, 86, 471.

Lt. Col. W. R. King, 1886-95. Reports, 86, 489; 87, 419; 88, 345; 89, 467; 90, 389; 91, 537; 92, 473; 93, 647; 94, 467; 95, 521.

Maj. W. T. Russell, 1896.

**POST OF FORT TOTTEN, N. Y.—U. S. ENGINEER SCHOOL—
BATTALION OF ENGINEERS—ENGINEER DEPOT—Cont'd.**

Maj. J. G. D. Knight, 1896-. Reports, 96, 451; 97, 559; 98, 563; 99, 650; 1900, 1045.

COMPANY A.

Officers in charge.

Capt. A. Stickney, 1868.
Capt. A. Mackenzie, 1869-73.
Lt. W. T. Russell, 1874.
Capt. J. W. Cuyler, 1875.
Capt. J. A. Mercer, 1876.
Capt. T. H. Handbury, 1877-79.
Capt. J. B. Quinn, 1880.
Lt. F. V. Abbott, 1881.
Capt. C. W. Raymond, 1882.
Capt. E. H. Rufner, 1883-84.
Capt. J. G. D. Knight, 1885-87.
Capt. S. W. Roessler, 1888-89.
Capt. C. B. Sears, 1890.
Capt. W. A. Fisk, 1894-95.
Capt. S. W. Roessler, 1896-97.

COMPANY B.

Officers in charge:

Capt. A. H. Burnham, 1868-70.
Capt. W. R. King, 1871-75.
Lt. J. B. Quinn, 1876.
Capt. A. M. Miller, 1877-81.
Capt. J. H. Willard, 1882-83.
Capt. C. F. Palfrey, 1884.
Capt. T. N. Bailey, 1885.
Lt. H. M. Chittenden, 1886.
Capt. E. Maguire, 1887-88.
Capt. R. L. Hoxie, 1889-90.
Capt. W. T. Russell, 1894-95.
Capt. W. C. Langfitt, 1896-97.

COMPANY C.

Officers in Charge:

Capt. A. H. Holgate, 1868.
Capt. O. H. Ernst, 1869-70.
Capt. W. C. Raymond, 1871-72.
Capt. J. C. Post, 1873.
Capt. W. R. Livermore, 1874-77.
Capt. J. F. Gregory, 1878-79.
Capt. J. C. Mallery, 1880-83.
Capt. P. M. Price, 1884-85.
Lt. W. C. Langfitt, 1886.
Capt. E. Bergland, 1887-90.
Capt. W. M. Black, 1894-95.
Capt. T. A. Bingham, 1896.
Capt. G. D. Fitch, 1897.

COMPANY D.

Officer in Charge.

Capt. S. M. Mansfield, 1867-70.
Practically abandoned in 1871; exists only in name, and is commanded by the battalion adjutant.

COMPANY E.

Officers in Charge:

Capt. W. Ludlow, 1867.
Capt. J. W. Cuyler, 1868.
Capt. P. C. Hains, 1869-70.
Capt. O. H. Ernst, 1872-78.

Capt. C. W. Raymond, 1880-81.

Maj. W. S. Stanton, 1882-85.

Capt. P. M. Price, 1886-88.

Capt. G. McC. Derby, 1889-90.

Capt. J. L. Lusk, 1894-97.

ASSISTANTS.

Reports:

Capt. J. B. Quinn, 80, 302; 81, 425.
2d Lt. W. L. Fisk, 80, 302, 312, 314;
(1st Lt.) 318, 319.
Lt. J. C. Mallery, 80, 305, 307; (Capt.) 84, 430.
Lt. E. Griffin, 81, 425, 429; 82, 448; 83, 394.
Lt. J. H. Willard, 81, 431, 433, 449, 452; 82, 449, 452.
Lt. W. H. Bixby, 83, 395, 398.
Lt. J. L. Lusk, 84, 429; 85, 432.
Lt. J. Millis, 84, 431.
Lt. H. F. Hodges, 84, 434; 85, 432.
Capt. S. W. Roessler, 85, 455; 86, 477; 87, 425, 433; 88, 360, 364; 89, 495; 90, 413, 419.
Lt. J. R. Warren, 88, 360; 89, 485; 91, 553.
Lt. I. Hale, 88, 370.
Lt. C. Harding, 90, 418.
Lt. A. M. D'Armit, 90, 421; 91, 565; 92, 490.
Lt. H. Jervey, 91, 559.
Lt. R. McGregor, 92, 484.
Lt. J. Morrow, 95, 532; 96, 455.
Lt. W. E. Craighill, 96, 460; 97, 564.
Lt. W. V. Judson, 97, 568.

SUMMARY OF REPORTS:

1865. Place constituted an engineer post and depot, selected as the headquarters of the Battalion of Engineers, and as the depot for the storage of the engineer material, 68, 21.

1867. By act of July 28, 1866, the 5 companies of the Corps of Engineer troops were constituted a Battalion of Engineers to be composed of 752 enlisted men. Three companies stationed at Willets Point, N. Y., 1 at Jefferson Barracks, Mo., and 1 en route for Yerba Buena Island, Cal. Act of July 13, 1866, separated the Military Academy from the Corps of Engineers. It had been a part of that corps, by law, for more than 64 years. 67, 15.

1868. Construction of quarters in progress. In compliance with G. O. 56, dated Aug. 1, 1866, schools were opened for the enlisted men. 68, 21.

1869. Permanent hospital completed; work on other buildings. Survey of the battlefield of Gettysburg in progress under command of Lt. T. Turtle. 69, 20.

1870. By authority of the Secretary of War, postconstituted the torpedo school of the Army; experimental work in progress. Work on buildings in progress. 70, 29.

**POST OF FORT TOTTEN, N. Y.—U. S. ENGINEER SCHOOL—
BATTALION OF ENGINEERS—ENGINEER DEPOT—Cont'd.**

1871. G. O. 122, series of 1870, reduced the strength of the 5 companies constituting the battalion, June 30, 1871, to 12 officers and 303 enlisted men. Companies A, B, and C stationed at Willets Point. Company E, composed of the detachment heretofore kept at the Military Academy to aid in instructing the cadets, increased to a full company and stationed at West Point. Company D practically disbanded by the reduction of the battalion. **71, 27.**

1877. Table giving a synopsis of the recruiting service and of desertions from June 30, 1865, to June 30, 1877, **77, 28.**

1880. New astronomical observatory completed. Total cost, \$842.49. \$9,000 allotted for quarters; work in progress; general repair of buildings. Statement of receipts and issues of materials. Calcium chloride used to dry the air in the store-rooms; formula given of the solution used. **80, 322; 81, 453; 82, 481.**

1881. A field astronomical observatory erected in 1868; regular series of meteorological observations and practice in making reconnoissance and surveys begun in that year. Use of photography for duplicating maps in the field begun in 1873. Tidal and current measurements begun in 1871. **81, 423.**

1882. Willets Point transferred from an ordinary military post into the Engineer School of Application, **82, 446.**

1883. Photographic laboratory built, **83, 403.**

1884. Sapping or molding shed built; cost, \$6,385, **84, 455.**

1886. Board of officers constituted by S. O. 187, A. G. O., Aug. 17, 1885, to consider and report upon the questions of water supply, sewers, and hospital accommodations at Willets Point. Report. **86, 484.** (Col. Q. A. Gillmore, Corps of Engineers, Lt. Col. H. G. Hodges, Q. M. G., and Maj. D. L. Huntington, surgeon, U. S. A.) Plan and estimate for brick barrack at Willets Point. **86, 486.**

1888. The Quartermaster's Department completed the water supply and sewerage systems, necessary plumbing for sanitary purposes in barracks and quarters, and the double set of officers' quarters and the new hospital building, **88, 345.** Experiments in electro-magnetism on a large scale made with 2 15-inch guns, a large quantity of torpedo cable, and a dynamo (photograph), **88, 354.**

1889. Laboratory for enlisted men built, target range improved and extended, and repairs made to buildings. A post canteen and a combined mess for enlisted men established. A detachment of officers and soldiers sent to Johnstown,

Pa., on June 5, 1889, to assist in bridging streams. **89, 467.** Experiments—tests of explosives, crater gauge, pressure gauge, range finders, transition indicators, Sim's torpedo, with results of tests and photographs. \$200,000 appropriated for torpedoes for harbor defense. Statement of funds and estimates required for the following year. **89, 478.** Report of board of officers upon torpedo material, with recommendations—reports on shackles and mooring rope, bronze torpedo case, cut-off boxes, operating box, and on a system of firing without the automatic switching on of the firing battery; McIntire jointer, and tests of fuses, **89, 489.** Board of engineers constituted by S. O. 31, to witness a test of the "automobile controllable torpedo" of J. H. Patrick; report giving description of torpedo and trials witnessed, **89, 497.** (Maj. W. R. King, Capt. S. W. Roesler, and Lt. I. Hale.)

1890. Experiments—trials of Sim's fish torpedo; torpedo drills; tests of explosives; crater gauge; sensitiveness of explosives; tests of insulated cable; self-acting mine; and building materials (photographs), **90, 401, 413.**

1891. New building for Engineer models, completed; cost, \$8,000. \$9,000 allotted for guardhouse and \$1,692.67 allotted for fire engines by the Quartermaster's Department. The title of "Engineer School of Application" changed, Sept. 24, 1890, by the Acting Secretary of War to "U. S. Engineer School." Lectures delivered—Foundations under difficulties, Mr. John Anderson; English engineering in Egypt, Dr. R. W. Raymond; Improvement of tidal rivers, Maj. C. W. Raymond; Concrete breakwaters, Capt. F. A. Mahan. Experiments—Sim's fish torpedo, tests of explosives, mortar practice with wooden projectiles described, building materials tested, and other torpedo experiments made. **91, 539, 553.**

1892. Fireproof storehouse for pontoon siege and torpedo materials nearly completed. Small steam tug for planting torpedoes completed. Cable storage tank built, and minor work. Property cared for and repaired. Sims-Edison fish torpedo delivered and tested. Tests of cables, circuit closers, self-acting mine mechanism, new form of electric current meter, building stone and cement, electric fuses, and other special tests made. **92, 479, 490.**

1893. Term of enlistment discussed, advantages to be gained by reducing it from 5 to 3 years, **93, 652.** Experiments—artificial heat used in drying mining casemates, 36 drums of cable received

**POST OF FORT TOTTEN, N. Y.—U. S. ENGINEER SCHOOL—
BATTALION OF ENGINEERS—ENGINEER DEPOT—Cont'd.**

from England and tested; trials of Sims-Edison fish torpedo continued, **93**, 656.

1894. Experiments—blasting concrete platforms, explosives, Sims-Edison torpedo, building materials; minor tests, **94**, 477.

1895. New barrack building completed, quarters moved, work on retaining wall around ice pond. Contracts for submarine mining material completed, cable tested. Experiments—explosives for breaking ice to improve navigation, Sims-Edison torpedo, pressure gauge improved; minor tests. **95**, 529.

1896. Old frame barrack and stable removed, new magazine rifle, U. S. model 1892, caliber .30, issued to the troops in July, 1895. Engineer models shipped to Atlanta, Ga., for the War Department exhibit. **96**, 451, 465.

1897. 4 batteries of artillery came to the post for artillery practice. Disputes concerning the commanding officer while in camp. **97**, 560.

1898. New regulations for the government of the U. S. Engineer School given, **98**, 565. On Apr. 4, 1898, Secretary of War authorized the increase of the battalion of Engineers from 500 to 702 enlisted men. Detachments for submarine mine defense of harbors sent out during Apr., 1898, from the 3 companies. Company D (a skeleton company for several years) was reorganized. Company A serving with troops at the Philippine Islands. Companies C and E serving with the army in Cuba. Company D detached for submarine mining duty at 19 harbors on the Atlantic, Gulf, and Pacific coasts. Company B engaged at the Engineer depot at Willets Point receiving, storing, and distributing the vast amount of torpedo material, pontoon equipment, siege materials, and instruments purchased and distributed from the depot. **98**, 6. Submarine mine material—lists of materials received with statement of funds, abstracts of proposals, etc., **98**, 571.

1899. G. O. 106, War Department, A. G. O., Washington, July 23, 1898, changed the name of the fort at Willets Point, N. Y., to Fort Totten, in honor of Brig. Gen. Joseph G. Totten, Chief of Engineers, who died Apr. 22, 1864, **99**, 651. Discussions on the army canteen, **99**, 652. Stations of the various companies given, **99**, 652. By act of Mar. 2, 1899, the enlisted strength of the battalion of Engineers was established as 752, its previous legal strength, and the battalion of Engineers, and the officers serving therewith, to constitute a part of the line of the Army, **99**, 657. Extracts from reports as to the service rendered by the

battalion of Engineers, **99**, 658. List of submarine mine materials, etc., and equipment of Engineer troops, **99**, 664. \$150,000 appropriated May 4 and July 7, 1898, for procurement of pontoon trains, intrenching tools, instruments, drawing materials, etc., and \$60,000 appropriated July 7, 1898, for employment of civilian assistants to Engineer officers in the field. Engineering supplies purchased for Engineer officers of seven Army Corps and for 3 regiments of volunteer Engineers in equipping them for duty in the field in Cuba, Porto Rico, and the Philippine and Hawaiian Islands. **99**, 8.

1900. \$50,000 appropriated Mar. 3, 1899, and \$25,000 appropriated for the fiscal year 1901, for equipment of Engineer troops and civilian assistants to Engineer officers, **1900**, 35. Stations of the different companies of the battalion of Engineers given, **1900**, 1051. Discussion on the legislation contemplating the transfer of submarine mining defenses to the artillery arm of the service, **1900**, 1046.

Miscellaneous reports.

Temporary detachments during the year, **80**, 297; **81**, 419.

Engineer recruiting and desertions and discipline, **80**, 208; **81**, 420; **82**, 445; **83**, 390; **84**, 426; **85**, 428; **86**, 491; **87**, 421; **88**, 350; **89**, 473; **90**, 394; **91**, 541; **92**, 475; **93**, 650; **94**, 470; **95**, 524; **96**, 463; **97**, 573.

Stations of the battalion at the end of the year, **80**, 299; **81**, 421.

Drills and instruction, **80**, 300; **90**, 397; **91**, 544; **92**, 477; **93**, 653; **94**, 473; **95**, 525; **96**, 462; **97**, 563, 571.

Course of instruction and drills given for future work, **80**, 302; **81**, 429; **82**, 472; **83**, 395; **84**, 449; **85**, 495; **86**, 474; **87**, 425.

Military duties of the battalion, **80**, 299; **81**, 422; **82**, 445; **83**, 391; **84**, 426; **85**, 429; **86**, 491.

Results of astronomical observations, **80**, 307; (maps) **81**, 433; **82**, 458; **85**, 436.

Results of meteorological observations, **80**, 312; **81**, 449; **84**, 448; **85**, 454.

The standing of the noncommissioned officers of the several companies of the battalion as determined by their recitations to their company officers during the winter season, **80**, 313; **81**, 448; **82**, 475; **84**, 453; **85**, 455.

Results of target practice (maps), **80**, 314; **81**, 425; **82**, 448; **84**, 430; **85**, 446. Modification of the system of target practice, **80**, 318.

Engineer School of Application, **81**, 422; **82**, 446; **83**, 392; **84**, 427; **85**, 429;

**POST OF FORT TOTTEN, N. Y.—U. S. ENGINEER SCHOOL—
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86, 474; 87, 415, 433; 88, 347; 89, 471; 90, 392; 91, 539; 92, 474; 93, 649; 94, 468; 95, 523; 96, 453; 97, 562; 98, 565; 99, 653; 1900, 1047.
Operations of the photographic laboratory, 80, 302; 81, 425; 82, 448; 83, 394; 84, 429; 85, 432; 88, 370; 90, 401.
Organization of the Engineer School of Application, 86, 474.
Course of winter instruction; 86, 477; 87, 425; 88, 357; 89, 484; 90, 409; 91, 553; 92, 484; 93, 662; 94, 481; 95, 532; 96, 457; 97, 566.
Course of summer instruction, 86, 481; 87, 428; 88, 360; 89, 487; 90, 407, 411; 91, 556; 92, 487; 93, 660; 94, 485; 95, 530; 96, 460; 97, 568.
Assignment to charge of departments of instruction, 86, 483; 87, 430; 88, 363.
Water supply, sewers, and hospital accommodations, 86, 484.
Plan and estimates for brick barrack, 86, 486.
Experiments and results, 87, 417 (photographs); 88, 351 (photographs); 89, 478; 90, 401; 91, 551, 559; 92, 481, 490; 93, 656; 94, 477 (photographs); 95, 529.
Public buildings and construction, 87, 422; 88, 355; 89, 476; 90, 398; 91, 547; 92, 479; 93, 648, 654; 94, 468, 474; 95, 527; 97, 574; 1900, 1052.
Depot property, 87, 423; 88, 355; 89, 478; 90, 399; 91, 548; 92, 480; 93, 655; 94, 475; 95, 527.
Quartermaster and Subsistence Department, 95, 522.
Marching, camping, and parades, 97, 571; 1900, 1047.
Torpedoes, list of material, etc., 97, 577; 98, 572; 99, 675; 1900, 1056.
Instruments, depot, 75, ii, 1109; 76, iii, 563; 78, iii, 1667; 97, 576; 99, 674; 1900, 1054, 1061.
Work of the different departments, 99, 656; 1900, 1047.
Statement of funds given in each report.

POTOMAC RIVER. (See *Washington, D. C.*)

PREBLE. (See *Maine coast.*)

PROCTORVILLE, LAKE BORGNE, LA. (See *New Orleans, La., and Sabine Pass, Tex.*)

PROVINCETOWN HARBOR. (See *Boston Harbor, Mass.*)

PUGET SOUND, WASH.

Contracts.

1897. Battery of 4 10-inch guns and 2 12-inch guns on nondisappearing carriages, \$163,453.50, 97, 768. 4 emplacements for 10-inch guns on disappearing carriages, \$84,980.50; battery for 16 12-inch mortars, \$78,052.01, 98, 809.

1898. Wharf, \$7,080.20; steel-hull tugboat, \$37,000; sand, large gravel and small gravel, 65 cents to \$1 per c. y., 99, 1011, 1015.

1899. Sand, small gravel, or broken stone, 55 cents per c. y., 1900, 1029.

Engineering features.

Concrete, cost per c. y., 1900, 1027, 1040, 1042.

Concrete, ingredients of, 1900, 1027.

Concrete mixing, method, 99, 1009; 1900, 1043.

Plant, arrangement of (tracings), 99, 1010.

Waterproofing, method of, 99, 1006; 1900, 1026, 1027, 1028, 1037.

Work, cost of, 98, 804, 805; 99, 1005, 1007, 1008; 1900, 1038, 1040, 1041, 1042.

Engineers.

CHIEF OF ENGINEERS. Reports, 96, 21; 97, 21, 763; 98, 32, 803; 99, 36, 1005; 1900, 33, 1026.

ENGINEERS IN CHARGE.

Capt. H. Taylor, 1896-1900.

Lt. M. L. Walker, 1899.

ASSISTANTS. Lt. M. L. Walker, 1897-1900.

Forts and batteries.^a—Operations.

Site 1—Battery for four 10-inch and two 12-inch guns, nondisappearing carriages.

1898. \$175,000 allotted. Work begun July 31, 1897, under contract.

^a List of works as arranged under this head—

Battery for four 10-inch and two 12-inch guns, nondisappearing carriages.

Site 2.—Emplacements for four 10-inch guns, disappearing carriages.

Site 2.—Mortar battery for sixteen 12-inch mortars.

Site 3.—Battery for five 10-inch and two 12-inch guns, nondisappearing carriage.

Site 3.—Emplacements for sixteen 12-inch mortars.

PUGET SOUND, WASH.—Continued.

Wharf built. Two 10 inch emplacements completed, except installing machinery; 2 others have the concrete about half laid, and 2 12-inch emplacements have the excavation completed; floors laid and forms built for concrete. 94,781 c. y. excavated for foundations and 6,292 c. y. concrete placed. Four 10-inch platforms ready for carriages; the 12-inch platforms ready in about 3 weeks. Two 10-inch and 2 12-inch carriages received. Itemized cost of work. 98, 803, 811.

1899. \$2,000 allotted. Work under contract completed Mar. 28, 1899. Part of the rooms covered with asphalt, and a facing of hollow brick put on outside the concrete. These have proved perfectly dry, while the rooms where these precautions were not taken have proved damp. Itemized cost of work. Three 10-inch and 2 12-inch carriages mounted, and 3 10-inch and 2 12-inch guns received. 99, 1005, 1014.

1900. Earth abutment against the walls through which moisture came excavated; the outside walls cleaned, plastered, and waterproofed with an alum-and-lye wash; a facing of hollow brick laid against the wall and the earth refilled. Three 10-inch and 2 12-inch guns mounted and the 12-inch guns fired. The remaining 10-inch gun and carriage received; mounting in progress by the artillery. All ordnance property turned over to ordnance officers. 1900, 1026, 1037, 1038.

Site 2—Emplacements for four 10-inch guns, disappearing carriages.

1898. \$95,000 allotted. Work begun Aug. 31, 1897, under contract. 37,154 c. y. excavated for foundations and 9,244 c. y. concrete placed; 2 emplacements practically finished, except lifts, trolleys, and other metal work. The platforms of the other 2 emplacements laid; floors laid and forms nearly all up. Itemized cost of work. 98, 805.

1899. \$7,600 allotted. Work under contract completed Dec. 15, 1898. Four carriages received. Itemized cost of work. 99, 1006, 1014.

1900. Slopes and drains repaired; minor work to be done. Four carriages assembled, and 3 rifles received and mounted. All ordnance turned over to the ordnance officer. 99, 1026, 1039.

Site 2—Mortar battery for sixteen 12-inch mortars, No. 1.

1898. \$90,000 allotted. Work begun under contract. 6,291 c. y. excavated for foundations. Six carriages received. 98, 808, 811.

1899. Work completed Mar. 14, 1899. Itemized cost of all work; 10 carriages received and 16 mounted. 99, 1008, 1014.

1900. Slopes and drains repaired and battery whitewashed. Twelve mortars received and mounted. All ordnance property turned over to ordnance officer. 1900, 1039.

Site 3—Battery for five 10-inch and two 12-inch guns, nondisappearing carriage.

1898. Plans being prepared, 98, 810.

1899. \$191,000 allotted. Work begun Sept. 6, 1898, by day labor. Excavation completed; 5,526 c. y. concrete placed. This included the manholes of drainage system, retaining walls, foundation throughout, all the storerooms at the ends of the emplacements, and practically the completion of all the gun platforms. 99, 1010.

1900. \$35,000 allotted. 18,456 c. y. excavated for foundations by day labor and 43,560 excavated by contract upon the superior slope put into back fill; 17,309 c. y. concrete placed; and minor work. Battery completed, except whitewashing and finishing of the walls, painting, and minor work. Description of work with itemized cost. Four 10-inch guns and 1 12-inch carriage received and mounted, and 1 10-inch rifle received. 1900, 1027, 1040, 1043.

Site 3.—Emplacements for sixteen 12-inch mortars.

1899. \$160,000 allotted. Battery to be built by hired labor. 99, 1012.

1900. Work begun July 6, 1899. 65,861 c. y. excavated for foundations, and 10,290 c. y. concrete placed. Battery practically completed; erecting trolleys, whitewashing and painting, installing electric system, and minor work to be done. Summary of work with itemized cost. 10 carriages received and mounted, and 16 mortars and 2 carriages on hand. 1900, 1028, 1041, 1043.

(Continued from page 1469.)

List of works as arranged under this head—

- Site 1.—Emplacements for two 5-inch R. F. guns on balanced pillar mounts.
- Site 2.—Emplacements for 5-inch R. F. guns on balanced pillar mounts.
- Site 3.—Emplacements for two 6-inch R. F. guns on balanced pillar mounts.
- Site 6.—Emplacements for two 6-inch R. F. guns, Brown's segmental pattern, on Navy mounts.
- Site 4.—Emplacements for three 8-inch guns on disappearing carriages.
- Site 4.—Emplacements for four 15-pounder R. F. guns on balanced pillar mounts.
- Site 4.—Emplacements for three 5-inch R. F. guns, Navy pattern, on pedestal mounts.
- Site 4.—Emplacements for two 15-pounder R. F. guns on balanced pillar mounts.
- Site 5.—Emplacements for two 15-pounder R. F. guns on balanced pillar mounts.
- Site 1.—Emplacements for sixteen 12-inch mortars, mortar battery No. 3.

PUGET SOUND, WASH.—Continued.

Site 1.—Emplacements for two 5-inch R. F. guns on balanced-pillar mounts.

1899. \$12,000 allotted. Plans prepared and part of plant accumulated. **99**, 1013.

1900. \$3,000 allotted. Work begun July 25, 1899, by hired labor. Small wharf built. 1,116 c. y. concrete placed, completing the work; awaiting arrival of mount. Itemized cost of concrete, also total cost per c. y. Work suspended Mar. 31, 1900. **1900**, 1031, 1037.

Site 2.—Emplacements for two 5-inch R. F. guns on balanced-pillar mounts.

1899. \$12,000 allotted. Plans prepared. **99**, 1013.

1900. \$6,850 allotted. Work begun Aug. 12, 1899, by day labor, and continued till Mar. 15, 1900, when work was suspended on account of lack of funds. Work to be resumed. **1900**, 1031, 1039.

Site 3.—Emplacements for two 5-inch R. F. guns on balanced-pillar mounts.

1899. \$11,000 allotted. Plans prepared. **99**, 1013.

1900. Work begun Apr. 7. Excavation completed and 1,095 c. y. concrete placed; mounts not yet received. Itemized cost of a c. y. of concrete. **1900**, 1031, 1043.

Site 5.—Emplacements for two 6-inch R. F. guns, Brown's segmental pattern, on navy mounts.

1899. \$5,000 allotted. Detailed survey of site made. Condemnation proceedings instituted for possession of title. **99**, 1013.

1900. \$15,000 allotted. Plans prepared; require modification to adapt them to the new style of mount; no information is at hand in regard to the requirements of the mounts; no work has been done. **1900**, 1030, 1044.

Site 4.—Emplacements for three 8-inch guns on disappearing carriages.

1899. Work in progress on a detailed survey of site, **99**, 1014.

1900. \$103,000 allotted. Work begun Mar. 1, 1900. Wharf built, site cleared, and excavation made by contract; 12,637 c. y. removed for excavation and placed in back fill. Erecting construction plant. **1900**, 1030, 1044.

Site 4.—Emplacements for four 15-pounder R. F. guns on balanced-pillar mounts.

1900. Plans and estimates prepared, **1900**, 1032, 1044.

Site 4.—Emplacements for three 5-inch R. F. guns, Navy pattern, on pedestal mounts.

1900. \$16,000 allotted for 2 emplacements. Some materials purchased. **1900**, 1032, 1044.

Site 4.—Emplacements for two 15-pounder R. F. guns on balanced-pillar mounts.

1900. \$8,500 allotted. Some materials purchased. **1900**, 1032, 1044.

Site 5.—Emplacements for two 15-pounder R. F. guns on balanced-pillar mounts.

1900. \$8,500 allotted. Some materials purchased. **1900**, 1032, 1044.

Site 1.—Emplacements for sixteen 12-inch mortars, mortar battery No. 3.

1900. Survey made of proposed site, and plans and estimates prepared, **1900**, 1038.

Miscellaneous.

Construction of a steel tug.

1899. \$16,000 allotted. Work begun under contract. **99**, 1015.

1900. Work completed. Used for hauling scows and making surveys and inspections. Of great service in facilitating and cheapening the construction work carried on since she was built. **1900**, 1036.

New light-house station at Admiralty Head.

1900. \$8,000 allotted. Plans prepared for a new station by the Light-House Department; turned over to the Engineer Department. **1900**, 1035.

Supplies for coast defense.

1900. \$500 allotted for purchase of approved supplies for the artillery garrisons. No requisitions received. **1900**, 1036.

Mounting guns and carriages.

1898. \$7,000 allotted. Two 10-inch and 2 12-inch non-d. carriages and 6 m. carriages received. Materials for mounting purchased. **98**, 811.

1899. \$15,000 allotted. Three 10-inch and 2 12-inch non-d. carriages and 16 m. carriages mounted. Four 10-inch d. carriages, 3 10-inch and 2 12-inch guns received. **99**, 1014.

1900. \$5,000 allotted. Six 10-inch guns, 32 12-inch m., 1 12-inch and 5 10-inch non-d. gun carriages, and 12 12-inch m. carriages received. Two 12-inch and 3 10-inch guns mounted on non-d. carriages, 3 10-inch guns on d. carriages, and 12 m. on their carriages. One 12-inch and 4 10-inch non-d. carriages, 4 10-inch

PUGET SOUND, WASH.—Continued.

d. carriages, and 4 12-inch m. carriages mounted. One 10-inch non-d. gun carriage and 8 12-inch m. carriages partly mounted. Six 12-inch mortars moved to the emplacements ready for mounting. Two 12-inch and 3 10-inch guns mounted on non-d. carriages, 3 10-inch guns mounted on d. carriages, 12 12-inch mortars mounted, 2 10-inch guns not mounted, 4 12-inch mortars not mounted, 1 10-inch d. gun carriage mounted, 1 10-inch non-d. carriage partly mounted, and 4 m. carriages mounted, were turned over to the artillery garrisons during the year. Since the above ordnance was turned over, the artillery mounted 1 10-inch gun on d. carriage and 4 mortars. 1900, 1033.

Preservation and repair.

1900. \$5,800 allotted. Slopes repaired; whitewashing and painting finished; waterproofing roofs of magazines; care of torpedo material, and miscellaneous work. 1900, 1034. \$5,000 allotted for road betterment, retrimming and regrading slopes, and planting a wind-break at 10-inch and 12-inch gun battery at site 1. \$3,700 allotted for repair of slopes of mortar battery No. 1. \$2,934 allotted for clearing, grubbing, grading, and seeding certain areas at site 1. No work done under the above allotment. 1900, 1035.

Range and position finders.

1900. \$4,946 allotted for a fire commander's station at site 1; \$2,370 allotted for 1 at site 2, and \$5,000 allotted for 1 at site 3. Plans being prepared. 1900, 1035, 1038, 1039.

Sites.

1897. \$650.74 allotted for surveys and incidental expenses; \$3,480 for purchase of site 1; \$7,200 for site 2, and \$43,075 for site 3. Two sites were ob-

tained partly by purchase and partly by condemnation; negotiations in progress for purchase of as much as possible of a third one. 97, 783.

1898. Site 3 acquired partly by purchase and partly by condemnation proceedings. Proceeding begun for acquiring two more sites. 98, 810.

1899. \$475 allotted for purchase of site 4. Condemnation proceedings in progress. One additional tract of land purchased. Title of lands abutting on the reservations at the sites of two groups of batteries already built deeded to the U. S. by the State of Washington. Arrangements made whereby the lighthouse reservation at the same locality is to be transferred to the War Department in exchange for two pieces of land now part of the military reservation. 99, 1014.

1900. \$38,600 allotted. Proceedings for acquiring title to sites 4 and 5 completed and amount of award paid. 1900, 1037.

Submarine mines.

1899. \$1,008.85 allotted for a cable tank and torpedo storehouse. Title to proposed site not yet secured. Temporary storage tank for cable on hand prepared by throwing a crib and earthen dam across a small creek. 99, 1016.

1900. \$9,000 allotted for torpedo storehouse. Work begun Apr. 25, under contract, the U. S. furnishing sand, gravel, and cement. Building partly completed. 1900, 1033, 1044.

Surveys.

Port Angeles, Wash.:

\$75,000 allotted for a reconnaissance to obtain data for developing a plan for defense, 98, 811.

PULASKI. (See *Georgia.*)

RED BANK, N. J. (See *Delaware River.*)

RHODE ISLAND. (See *Massachusetts and*)

ROCK POINT, MD. (See *Baltimore, Md.*)

ST. AUGUSTINE, FLA. (See *Florida, East Coast, and Key West.*)

SABINE PASS, TEX. (See *New Orleans, La.*)

ST. FRANCIS BARRACKS. (See *Florida, East Coast, and Key West.*)

ST. JOHNS RIVER, FLA. (See *Florida, East Coast, and Key West.*)

ST. PHILIP. (See *New Orleans, La., etc.*)

SAN DIEGO, CAL.

Contracts.

1896. Two 10-inch gun emplacements and a torpedo casemate, \$109,417.39, 97, 748.

1898. One 10-inch gun emplacement, \$37,788.68, 98, 778.

1899. Imported Portland cement, \$2.83 per barrel. Crushed stone, \$1.75 per c. y. Random stone, \$1.90 per c. y. 99, 975, 976.

Engineering features.

Base ring, method of leveling, 1900, 977.

Cement, testing of, 1900, 979.

Concretes, comparison of, 1900, 978.

Concrete, ingredients, 1900, 979.

Concrete, mixing of, 97, 747; 99, 976.

Concrete, placing of, 1900, 979.

Platforms, built as a monolith, 98, 776.

Sand, bearing power of, 97, 746.

Ventilating, method of, 1900, 978.

Waterproofing, method of, 1900, 978.

Engineers.

CHIEF OF ENGINEERS. Reports, 72, 24; 73, 24; 74, 28; 75, 28; 76, 29; 77, 24; 78, 27; 79, 32; 80, 51; 81, 52; 82, 50; 83, 46; 84, 52; 85, 45; 86, 45; 86, 19, 528; 97, 20, 744; 98, 30, 775; 99, 34, 975; 1900, 31, 974.

BOARD OF ENGINEERS. Constituted 1882 to consider and report upon the construction of fortifications, and what number if any could be dispensed with. Report, 82, 427.

ENGINEERS IN CHARGE:

Col. C. S. Stewart, 1873-86.

Maj. C. E. L. B. Davis, 1897-99.

Capt. J. J. Meyler, 1899-1900.

ASSISTANTS:

Lt. C. L. Potter, 1897.

Lt. H. Deakyne, 1897-98.

Capt. J. J. Meyler, 1898.

Forts and batteries. a — Operations.

Fort at San Diego, Cal.

1872. Plans prepared, 72, 24.

1873. \$50,000 appropriation. Work begun; necessary buildings erected. 73, 24.

1874. Site cleared; 27,626 c. y. earth placed in the embankment; concrete drains built; foundation of one magazine laid and its walls carried up to the spring of the main arch, 74, 28.

Ten-inch battery.

1897. \$115,000 allotted. Work begun under contract for 2 emplacements; wharf built. Concrete work begun; ex-

a List of works as arranged under this head—
Fort at San Diego, Cal.
Ten-inch battery.

cavation work nearly completed; concrete work in progress. Methods of work. 97, 746.

1898. \$48,000 allotted for a third emplacement under contract. All work completed; guns and carriages mounted; description of work. 98, 775.

1899. \$60,000 allotted for a fourth emplacement by hired labor. Work begun. 16,000 c. y. excavated for foundations; concrete finished, waterproofing completed, and emplacement completed, except some minor work. 99, 975.

1900. \$1,100 allotted; concrete work completed; gun and carriage mounted; waterproofing magazines in progress; work nearly completed, 1900, 974, 977.

Fifteen-pounder R. F. battery.

1899. \$8,865 allotted. Work begun on 2 emplacements. Excavation completed, and concrete work begun and nearly completed. 99, 978.

1900. Battery completed except 2 gun platforms awaiting the arrival of the well linings for the gun mounts, 1900, 975, 978.

Five-inch R. F. battery.

1900. \$18,270 allotted. Work begun for 2 emplacements; excavation and back filling done by contract. Concrete work completed; drainage system completed. Battery completed except platform awaiting mounts. 1900, 976, 978.

Preservation and repair.

1898. \$720 allotted for care and general repairs, 98, 778.

1899. \$360 allotted; general repair of buildings, fences, and grounds, etc., 99, 979.

1900. \$1,440 allotted. Electrical instruments cared for; care of property. 1900, 977.

Range and position finders.

1900. \$2,500 allotted for battery commander's station. Work begun; concrete work and station completed, except minor work. 1900, 976, 980.

Sites.

\$2,500 allotted for purchase of site for mortar battery, \$2,031.50 paid for 40.63 acres, 97, 748.

Submarine mines.

1897. \$8,030 allotted; mining casemate being built under contract, 97, 20, 747.

1898. Casemate completed, 98, 776. \$1,700 allotted for a cable tank; work begun in May and completed in June, 98,

List of works as arranged under this head—Crd.
Fifteen-pounder R. F. battery.
Five-inch R. F. battery.

SAN DIEGO, CAL.—Continued.

777. \$7,800 allotted for mining defense; mines planted and channel guarded by 2 Napoleon guns, 98, 777.

1899. \$2,200 allotted for additions and changes, mining casemate; work completed, 99, 777. \$4,840 allotted for a torpedo storehouse. Work begun in August

and completed in April, and torpedo materials stored. 99, 978. All mines removed from harbor, 99, 979.

1900. Torpedo casemate completed and storage battery installed, 1900, 974. Wharf and tramway built near torpedo storehouse, 1900, 975, 980.

SANDY HOOK. (See *New York Harbor*.)**SAN FRANCISCO, CAL.****Engineering features.**

Air space, description of, 99, 982.

Asphalt, composition of, 96, 534, 535; 99, 982; 1900, 982, 1013.

Aprons, concrete, description of, 96, 534, 535.

Bolt, anchor, setting, 96, 536.

Concrete, cost per c. y., 93, 621; 94, 465; 96, 528, 530; 97, 754; 98, 788, 793; 1900, 987, 994.

Concrete, ingredients of, 93, 620; 99, 987; 1900, 982, 988.

Concrete, mixing, 93, 620; 99, 987; 1900, 982, 990, 1009.

Concrete, placing, 1900, 1003.

Concrete, settlement of, 99, 985.

Cracks in retaining walls, 99, 982, 985; 1900, 990, 1012, 1013.

Damp courses, 99, 957, 969; 1900, 982.

Materials, cost of, 93, 620; 94, 465; 96, 529, 537; 97, 987; 1900, 987, 994.

Mixer, gravity, description of, 1900, 1009.

Mortars, firing, 97, 753.

Parapet and traverse, method of building, 1900, 989.

Plant, electric light and power, description of, 1900, 991, 1007.

Plant, description of, 93, 620; 1900, 989, 993.

Surfaces, concrete, finishing, 96, 536.

Tile, placing, 1900, 982.

Water-supply system, 1900, 993.

Whitewash for walls and ceilings of rooms and passages, composition of, 99, 987.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 17; 67, 14; 68, 19; 69, 19; 70, 26; 71, 24; 72, 22; 73, 23; 74, 27; 75, 26; 76, 28; 77, 23; 78, 26; 79, 31; 80, 52; 81, 52; 82, 51; 83, 47; 84, 52; 85, 45; 86,

45; 91, 8; 92, 8; 93, 9; 94, 10; 95, 11, 515; 96, 19, 528, 530; 97, 20, 744, 748; 98, 30, 779; 99, 35, 980; 1900, 32, 980.

BOARD OF ENGINEERS:

Constituted, 1862, to consider and report upon the construction of fortifications, and what number, if any, could be dispensed with. Report, 82, 427.

Estimates, 1881, 87, 11.

Estimates, 1889, 89, 6.

ENGINEERS IN CHARGE:

Col. R. E. de Russey, 1866.

Maj. G. H. Elliot, 1866-70.

Lt. Col. G. H. Mendell, 1867-86.

Col. C. S. Stewart, 1870-86.

Col. G. H. Mendell, 1891-96. Reports, 93, 619, 94, 465.

Lt. Col. W. H. H. Benysaurd, 1893-96. Report, 93, 623.

Lt. C. L. Potter, 1896.

Maj. C. E. L. B. Davis, 1896-1900.

Capt. J. E. Kuhn, 1896.

Maj. W. H. Heuer, 1898-1900.

Col. S. M. Mansfield, 1899.

ASSISTANTS:

Lt. H. C. Newcomer, 1891-92.

Lt. C. L. Potter, 1891-97.

Lt. C. A. F. Flagler, 1893-95.

Capt. J. E. Kuhn, 1895-98.

Capt. H. Deakyn, 1896-1900.

Lt. H. C. Wolf, 1898-99. Reports, 93, 787, 794.

Lt. L. M. L. Walker, 1898.

Capt. F. R. Shunk, 1898-99.

Lt. W. Kelly, 1899-1900.

Fort and batteries.^a—Operations.*Fort Winfield Scott.*

1853. Work begun, 83, 47.

1870. Exterior earthen batteries begun, 83, 47.

^aList of works as arranged under this head—

Fort Winfield Scott.

Fort at Fort Point.

Battery at Point José.

Fort on Alcatraz Island.

Fort at Lime Point.

Point Lobos.

Batteries on Angel Island.

Fort Mason.

South side of bay.—Emplacements Nos. 9, 10, 11, 12, 13, for 10-inch rifles on disappearing carriages.

South side of bay.—Emplacements Nos. 14, 15, 16, 18, 19, for 12-inch rifles on barbette carriages.

South side of bay.—Mortar battery No. 2.

SAN FRANCISCO, CAL.—Continued.

1882-86. General repairs for preservation, 83, 47; 84, 53; 85, 45; 86, 45.

Fort at Fort Point.

1863. Work begun, 53, 52.

1866. Ironwork cleaned and painted; drainage repaired; some work on sea wall, 66, 17.

1867. Work on painting ironwork, drainage, sea wall, excavation for western casemated battery; excavation for sea wall begun; heavy cofferdam built for a distance of 350 f. along the shore; buildings removed from site of new battery; wharf extended and repaired, 67, 14.

1868. Railroad completed, coping of old wall extended 126 f., cofferdam for protection of site of new sea wall completed, 68, 19.

1869. Repair of quarters; minor work on sea walls, etc., 69, 19.

1870. Importance of fort. General repair of quarters. Modification plans prepared, 70, 26.

1871. \$50,000 appropriated. Work begun on batteries to the south of fort, 29,586 c. y. embankment placed, 7,180 s. y. slope sodded. Work on breast-height wall and traverse magazines; 1,928 c. y. masonry placed. Repair of wharf, buildings, etc. 71, 24.

1872. \$85,000 appropriated. Work on breast-height wall; 8 front-pintle stone platforms placed, and the masonry of 12 others completed; 2 traverse magazines built, 10 others finished; 1,324 l. f. of earthwork of barbette batteries completed; magazine doors made and hung; and minor work. 72, 22.

1873. \$65,000 appropriated; 830 l. f. of parapet of barbette and mortar batteries nearly completed; 6 magazines built and work on 3 others and on embankments; 11 pintles and sets of traverse rails placed for heavy guns; 8 platforms

for heavy mortars placed; and minor work, 73, 23.

1874. \$30,000 appropriated. 4 service magazines built; work on concrete foundation for 8 platforms for heavy guns; pintles and rails placed on 2 platforms for 15-inch guns, and 4 platforms for heavy mortars built. Work on embankment; asphalt floors placed in 11 traverse magazines; wharf rebuilt; minor work. 74, 27.

1875. \$25,000 appropriated. Work on 1 service magazine; breast-height walls for 8 heavy guns completed; 8 pintle blocks placed, as well as concrete foundations for 12 platforms for heavy guns; 9,443 c. y. earth embanked in parapets and traverses, and 6,743 s. y. sodding placed on slopes; minor work. 75, 26.

1876. Breast-height wall for 6 heavy guns completed and concrete foundations for 2 heavy gun platforms placed. 8,365 c. y. earth embanked in parapets and traverses and 3,777 s. y. sodding placed on slopes; doors completed and hung in 7 traverse magazines; minor work. 76, 28.

1877-79. Care and preservation, 77, 23; 78, 26; 79, 31.

1880. History and importance of fort, 80, 52.

1881. Repair of quarters, slopes, etc., 81, 52.

1882. Condition of works, 82, 51.

Battery at Point Jost.

1866-70. Modification plan submitted, 66, 18; 70, 27.

1870. Three 5-inch Rodman guns brought to the rear of battery, 70, 23.

1880. History of battery. Timber magazine in earthen battery rebuilt and 3 timber platforms replaced for purposes of drill and practice firing. 80, 53.

(Continued from page 1474.)

List of works as arranged under this head—

- North side of bay.—Emplacements for three 12-inch rifles on nondisappearing carriages.
- South side of bay.—Pneumatic dynamite-gun battery.
- South side of bay.—Emplacement No. 8, for 12-inch nondisappearing carriage.
- South side of bay.—Mortar battery No. 2.
- Platforms for four 8-inch rifles.
- Island in harbor.—Emplacement for one 8-inch B. L. rifle on nondisappearing carriages.
- North side of bay.—Two emplacements for 8-inch B. L. rifles, nondisappearing carriages.
- South side of bay.—Two emplacements for 6-inch guns on balanced pillar mounts.
- Ten platforms for 8-inch converted rifles and one service magazine.
- South side of bay.—Three emplacements for 8-inch rifles on disappearing carriages.
- South side of bay.—Emplacement for 8-inch gun on disappearing carriage.
- North side of bay.—Emplacements for two 12-inch guns on disappearing carriages.
- North side of bay.—Emplacements for two 6-inch R. F. guns on balanced pillar mounts.
- Island in harbor.—Emplacement for one 8-inch gun on disappearing carriage.
- South side of bay.—One emplacement for a 5-inch R. F. gun on balanced pillar mount.
- South side of bay.—Emplacements for two 6-inch guns on disappearing carriages.
- South side of bay.—Emplacements Nos. 6, 7, for 12-inch rifles on disappearing carriages.
- South side of bay.—Emplacements for two 6-inch R. F. wire-wound guns.
- South side of bay.—Emplacements for two 15-pounder R. F. guns.
- South side of bay.—Emplacements for two 12-inch guns on disappearing carriages.
- South side of bay.—Emplacements for sixteen 12-inch mortars.
- Island in harbor.—Emplacements for two 12-inch R. F. wire-wound guns.

SAN FRANCISCO, CAL.—Continued.

Fort on Alcatraz Island.

1866. Work on new bomb-proof barrack; new ramp built from guardhouse to summit of the island; new wharf built; old platforms removed; minor work, **66**, 18.

1867. Work on new barrack; rock excavation made for extension of Battery Rosecranz. Resurvey of island in progress. **67**, 15.

1868. Wharf extended; a number of permanent center pintle platforms adopted for 8-inch and 10-inch guns; work on new barrack, **68**, 20.

1869. 4,000 c. y. rock excavated and thrown over the scarp walls; repair of buildings, etc., **69**, 19.

1870. Importance of fort. Modification plans prepared. 18,000 c. y. rock excavated for foundations, and work begun converting gun rooms into a magazine traverse. **70**, 27.

1871. \$75,000 appropriated. Gun platforms in batteries 1 and 4 removed; 3 service magazines in battery 2 completed; 1 service magazine built in battery 3, and breast-height wall for 2 guns begun; excavation for foundation of battery 5. **70**, 25.

1872. \$42,500 appropriated. Battery 4—breast-height wall for 2 guns built, parapets made and sodded, magazine completed; 3 magazines in battery 2 covered and sodded; work on large magazine. Battery 5—2 granite platforms for 15-inch guns, with circular breast-height walls, built and sodded; service magazine nearly completed; minor work. **72**, 26.

1873. \$50,000 appropriated. North caponiere completed, covered and sodded; 6 magazines and 3 shell rooms built; work on retaining walls and parapets for guns; excavations for batteries 5 and 6 completed. Filling in mortar battery begun; minor work. **73**, 24.

1874. \$20,000 appropriated. South caponiere partly remodeled, 2 magazines with bomb-proofs built, breast-height walls for 2 guns built, and 2 stone platforms laid; parapets for 4 guns made; 6,300 s. y. sodding laid on parapets, magazines and slopes; wood revetment in rear of wharf replaced with a substantial stone wall laid in mortar; work on retaining wall. **74**, 28.

1875. \$25,000 appropriated. 469 c. y. masonry placed in magazine; 2,250 s. y. sod placed on slopes; 36,930 c. y. excavation made; minor work. **75**, 27.

1876. 2 magazines and 2 bomb-proofs built; 3 adjacent wings of the breast-height wall built; 2 drains extended, and wharf repaired, **76**, 28.

1877. 5,368 c. y. excavated for parade ground by the prisoners. Magazine P covered with earth, its floor asphalted,

and gutters in passageway concreted. **77**, 23.

1878. Care and preservation, **78**, 27.

1879. Wharf painted; general repairs of buildings, **79**, 31.

1880. History and importance of fort, **80**, 53.

1882-83. General repairs, **82**, 53; **83**, 49.

1885. 2 stone platforms completed, **85**, 47.

Fort at Lime Point.

1866. Title approved and land bought, **66**, 18.

1867. Work begun; excavation for foundation in progress, **67**, 15.

1868. Necessary buildings erected; water supply for fire purposes installed; fence and wharf built; steamboat built for service on the work; 60,000 c. y. rock excavated and a tunnel 60 f. long excavated for a large blast, **68**, 20.

1869. 90,000 tons of rock removed by 2 blasts; work of excavating for foundations completed; fence completed, **69**, 19.

1870. Importance of fort. Project. **70**, 27.

1871. \$100,000 appropriated. Wagon road built; 4 magazines in Gravelly Beach Battery completed; excavation for batteries on the cliffs; minor work. **71**, 24.

1872. \$75,000 appropriated. Gravelly Beach Battery—2 magazines completed, 6 covered with earth and sodded, a breast-high timber revetment placed, and concrete foundations for guns put in. Lime Point Ridge—breast-high walls for 4 front and 5 center-pintle guns built of masonry; 4 magazines built, covered with earth and sodded; 4 stone platforms for front-pintle 15-inch carriages completed; parapets for 9 guns and 6 mortars finished, and 3 mortar platforms made and placed. Point Cavallo Battery—work on roadway and excavation. **72**, 22.

1873. \$160,000 appropriated. Gravelly Beach Battery—12 wooden platforms placed and battery nearly completed; 3 13-inch mortar platforms placed in the Ridge Battery. Point Cavallo Battery—5 magazines built and work on 6 others; parapets and terreplein. **73**, 23.

1874. \$30,000 appropriated. Point Cavallo, work nearly completed. Gravelly Beach parapets and traverses repaired; new road, 4,200 l. f., completed near Point Diablo. **74**, 27.

1875. \$20,000 appropriated. 5,950 l. f. of road built to site of batteries near Point Diablo; gun battery in advance at Point Cavallo completed, except gun platforms; 8 breast-high walls laid in Point Cavallo Battery; minor work. **75**, 27.

SAN FRANCISCO, CAL.—Continued.

1876. Hoods placed on traverses at Point Cavallo Battery; 4,000 c. y. earth and 2,535 s. y. sodding placed. Repairs at the Ridge and Gravelly Beach batteries. 76, 28.

1877. Property in charge of fort keepers, 77, 23.

1880. History and importance of the fort, 80, 52.

1882. Condition of works, 82, 52.

Point Lobos.

1866. Topographical survey made, 66, 18.

Batteries on Angel Island.

1870. Modification plans prepared, 70, 28.

1880. History and importance of batteries, 80, 53.

Fort Mason.

1883. Two temporary earthen batteries built during the civil war, 83, 49.

South side of bay.—Emplacements Nos. 9, 10, 11, 12, and 13, for 10-inch rifles on disappearing carriages.

1891. Work begun on excavation, 91, 8.

1892. Excavation completed, and concrete work in progress, 92, 8.

1893. Concrete work completed; awaiting details of carriages to be used. Work described. 93, 619.

1894. Top surfaces of magazines plastered and painted with waterproof paint. Roadway being built. 94, 10.

1895. Details of carriages received and concrete work in progress on platforms, 95, 516.

1896. Parapets and magazines completed and 3 inches asphalt covering placed; 3 platforms completed, 1,319 c. y. concrete placed, ammunition service installed, 2 guns and carriages received; mounting was begun but stopped to alter carriages. Itemized cost of work. 96, 535.

1897. 2 guns mounted in emplacements Nos. 11 and 12. Work in progress; mounting gun in emplacement No. 13. \$57,000 allotted for emplacements Nos. 9 and 10. Work begun in June, excavation completed and some concrete work done; itemized cost of work. 99, 749, 755.

1898. Concrete work of emplacements Nos. 9 and 10 completed; machinery installed and guns and carriages mounted; guard and relocater room built; itemized cost of work, 98, 779, 788.

1900. Steps at emplacements Nos. 11 and 12 repaired, 1900, 988.

South side of bay.—Emplacements Nos. 14, 15, 16, 18, and 19, for 12-inch rifles on barbette carriages.

1892. Work begun on emplacements Nos. 14, 15, and 16; excavation completed and concrete work in progress, 92, 8.

1893. Concrete work completed; awaiting details of carriages to be used. Work described. 93, 619.

1894. Top surfaces of magazines plastered, and painted with a waterproof paint. Roadway being built. 94, 10.

1895. Details of carriages received. One emplacement completed, railroad iron and cable placed in concrete, gun mounted, and work in progress on another. 95, 11, 515.

1896. Parapets, aprons, and magazines of 3 emplacements completed and covered with a 3-inch layer of asphalt. Gun fired 17 times to test asphalt covering. 2 other platforms built, railroad iron and cable placed in concrete, and 1 gun mounted. Ammunition service installed, and all engineering work of the 12-inch emplacement completed except setting base ring in 1 emplacement; carriage not yet received, itemized cost of work. 96, 564.

1897. Work begun on emplacements Nos. 18 and 19 in Nov., 1896; concrete work completed; 4,576 c. y. placed; all machinery installed; 1 gun mounted in emplacement No. 18. Itemized cost of work. 97, 749, 754.

1898. Guard and relocater room emplacement No. 14 completed; itemized cost. Minor work completed. Gun mounted in emplacement No. 19, and the completed battery turned over to the troops. Itemized cost of work for emplacements 18 and 19. 98, 791.

1900. Latrine built; description and itemized cost, 1900, 988.

South side of bay.—Mortar battery No. 2.

1893. Work begun Apr. 5, 1893; 10,781 c. y. excavated for foundation, completing same; 528 c. y. concrete placed; drainage in progress; conduit for electric-firing wires laid in floor, 93, 622.

1894. 32,324 c. y. earth excavated, 7,097 c. y. concrete and 44,124 c. y. filling placed. 2 platforms laid in granite; electric-light system installed; minor work. 94, 11, 465.

1895. All concrete work completed, slopes sodded and seeded, 16 mortars mounted, firing cable installed, picket fence built around the battery; battery completed except ammunition conveyers, 95, 14, 516.

1897. Ammunition conveyers, etc., being installed, a new firing room built,

SAN FRANCISCO, CAL.—Continued.

and a new firing circuit installed, 97, 748, 753.

1898. Relocator room built; speaking tubes installed; cost of work, 98, 788.

North side of bay.—Emplacements for three 12-inch rifles on nondisappearing carriages.

1894. \$72,000 allotted, 1892. Work begun in February for 2 emplacements; concrete work completed as far as contemplated and 4 inches of asphaltum placed on top of the emplacements; magazine doors made and hung; minor work. 94, 11.

1895. \$36,761.29 allotted. 4,870 c. y. loose rock excavated for another emplacement; concrete work in progress. 95, 12.

1896. \$8,400 allotted for 3 gun platforms; 1 completed and work on the other 2 in progress. Itemized cost of work. 96, 528.

1897. Ammunition service installed; 2 guns and carriages mounted; work on the other gun and carriage. Mounting of guns and carriages done by the Artillery. 97, 744.

1898. Battery completed; 3 guns and carriages mounted; battery and covered way leading back to the main road surrounded with barbed-wire entanglements, and a stockade built across the end of the covered way, 98, 780.

1900. Slight alteration of trucks of ammunition service. Waterproofing magazines in progress, previous work unsuccessful. 1900, 1011.

South side of bay.—pneumatic dynamite gun battery.

1896. Three 15-inch guns mounted; compressor plant in place. No form of protection undertaken. 96, 533.

1899. \$150,000 appropriated. High earthen traverse built nearly around power house, kept in place by a high concrete retaining wall; wall badly cracked; 120,000 c. y. back filling placed; work in progress. 99, 981.

1900. Magazines and traverses completed, built of 90,000 c. y. of sand; 7 1½-inch iron rods, each 120 f. long, were driven through the sand to the rear walls of the gun pits, thus tying the retaining wall to the rear walls of the gun pits. Completed battery turned over to the Artillery. Description of placing sand and of making slopes. 1900, 909.

South side of bay.—Emplacement No. 8, for 12-inch nondisappearing carriages.

1897. Work begun in Oct., 1896; concrete work completed, 4,257 c. y. placed. Machinery installed and em-

placements nearly completed. Itemized cost of work. 97, 749, 754.

1898. Machinery installed and minor work done; cost; carriage not yet received, 98, 780, 789.

1899. Gun and carriage mounted and emplacement turned over to the Artillery, June 15, 1899, 99, 981.

South side of bay.—Mortar battery No. 2.

1897. \$108,000 allotted. Work begun in June; site cleared. 97, 750, 755.

1898. 43,500 c. y. excavated; 45,850 c. y. back fill, and 9,920 c. y. concrete placed; carriages mounted. Battery completed, except installing electric plant and mounting mortars; itemized cost of work. 98, 779, 793.

1899. Mounting mortars completed, 99, 981.

1900. Electric-light plant to be installed, 1900, 981.

Platforms for four 8-inch rifles.

1897. \$1,400 allotted. 4 platforms for converted rifles nearly finished. 97, 750.

1898. 4 platforms for 8-inch converted rifles completed and armed, 98, 786.

Island in harbor.—Emplacement for one 8-inch B. L. rifle on nondisappearing carriage.

1898. \$31,000 allotted. Work begun April 1; necessary buildings erected; excavation completed; 2,300 c. y. concrete placed; on June 20 the entire work was completed awaiting arrival of carriage. Itemized cost of work. 98, 781, 794.

1899. \$2,000 allotted. Electric-light plant installed; no base ring received. 99, 989.

1900. \$500 allotted. Carriage received; minor repairs of concrete of lookout, latrine, and wooden steps; gun mounted; emplacement transferred to the Artillery on May 1, 1900. 1900, 1006.

North side of bay.—Two emplacements for 8-inch B. L. rifles, nondisappearing carriages.

1898. \$55,000 allotted. Work begun Apr. 9, and the work nearly completed; awaiting arrival of carriages. 98, 781.

1899. \$3,000 allotted. Total of 17,885 c. y. excavation and 2,700 c. y. concrete placed; electric-light plant and ammunition service installed; walls and ceiling whitewashed; reservoir, capacity of 10,000 gallons, built; minor work; no carriages received. Itemized cost of work. 99, 986.

SAN FRANCISCO, CAL.—Continued.

1900. \$1,505 allotted. Guns and carriages received, and moved from wharf to site of battery under contract; base rings set and battery turned over to the Artillery May 5, 1900. 1900, 1011.

South side of bay.—Two emplacements for 5-inch R. F. guns on balanced-pillar mounts.

1898. Work begun Mar. 16; excavation completed and concrete work in progress; work delayed; cylinders to pivot the guns not on hand; concrete work on relocater and entrance to old magazine completed; itemized cost of work, 98, 781, 791.

Ten platforms for 8-inch converted rifles and one service magazine.

1898. \$3,700 allotted. 3 built on north side of bay and 3 on an island in the bay. Old timber magazine on the island repaired. 98, 786.

1899. 2 guns and carriages mounted, in good condition; 2 mounted on practice platforms; 6 guns and carriages received but not mounted, 99, 990.

1900. 3 emplacements on an island in the bay. All armament removed to make way for permanent rapid-fire gun emplacement. 1900, 1008.

South side of bay.—Three emplacements for 8-inch rifles on disappearing carriages.

1899. \$67,000 allotted. Work begun and completed, except the magazine doors, electric lights, and minor work. Air space formed in one emplacement by placing hollow partition tile around the magazine. Damp-proof course laid over the magazine. 99, 982.

1900. \$8,000 allotted. Magazine doors placed, trolleys installed, electric-light plant installed, guns mounted, and battery turned over to the Artillery. All concrete surfaces exposed to view from the harbor were painted with paraffin paint to conceal them. 1900, 987.

South side of bay.—Emplacement for 8-inch gun on disappearing carriage.

1899. \$28,700 allotted. Work begun in February and completed, except electric plant, ammunition hoist, and minor work. 99, 983.

1900. \$4,000 allotted. Fence built around battery, trolleys installed, electric-light plant installed by contract, speaking-tube connections made with emplacements for 8-inch converted rifles and the relocater room. Ammunition hoists and base ring still to be set in place. Description of excavation work, concrete mixing, tile placing, and cement

finishing, with itemized cost of all work. 1900, 981.

North side of bay.—Emplacements for two 12-inch guns on disappearing carriages.

1899. \$67,000 allotted. Work begun. Owing to the peculiarly sheltered position of this battery, provision had only to be made against direct penetration, and all concrete surfaces were so shaped as to deflect any impinging shot. Work delayed awaiting settlement of concrete. Old flat traverse irons distributed through the concrete to resist the effect of unequal settlement. 99, 985.

1900. \$8,000 allotted and \$3,913 transferred from other works. All cracks in concrete repaired, and asphalt laid on upper surfaces of the concrete covering of the rooms; electric plant installed and tested. Carriages moved from landing to site of battery under contract; base rings set in June. Summary and itemized cost of battery. 1900, 1013.

North side of bay.—Emplacements for two 5-inch R. F. guns on balanced pillar mounts.

1899. \$25,000 allotted. Work begun on excavation, making roadway, storing the necessary gravel and sand obtained from the beach. 99, 986.

1900. Excavation completed, foundations and drains laid, road to site of battery built, and materials for concrete work stored. Work suspended awaiting arrival of ironwork of the balanced pillar mounts. 1900, 1012.

Island in harbor.—Emplacement for one 8-inch gun on disappearing carriage.

1899. \$36,000 allotted. 99, 988.

1900. \$2,100 allotted, and \$3,492.70 transferred from other allotments. Work begun in July, 1899. As the site of the battery was occupied by a reservoir of 150,000 gallons capacity, a new reservoir had to be built; tank completed. All stone was received from a quarry on Angel Island and crushed for use. Concrete work completed, about 2,000 c. y. placed, electric-light system and ammunition service installed and battery completed, except placing the base ring not received. Description of work, with itemized cost. 1900, 1006.

South side of bay.—One emplacement for a 5-inch R. F. gun on balanced pillar mount.

1899. \$6,000 allotted. Materials purchased. 99, 981.

1900. Work begun, excavation completed, road prepared, and the loam

SAN FRANCISCO, CAL.—Continued.

placed on slopes for a top dressing. Work suspended awaiting the arrival of iron-work of the balanced pillar mount. 1900, 988.

South side of bay—Emplacements for two 6-inch guns on disappearing carriages (part of the heavy rapid-fire armament).

1899. \$56,000 allotted. Work begun on excavation. 99, 981.

1900. \$3,050 transferred from other works. Excavation completed; new water-supply system installed; concrete work begun in October; battery entirely completed by June; no guns on hand; description of mixing concrete. 1900, 990.

South side of bay—Emplacements Nos. 6 and 7, for 12-inch rifles on disappearing carriages.

1899. \$75,500 allotted. Work begun in Sept., 1898, and practically completed in the spring of 1899. Guns and carriages not received. 99, 981.

1900. Floor of dynamo room laid, aprons built, base rings set; battery entirely completed in November and turned over to the Artillery, who mounted the guns, 1900, 988.

South side of bay—Emplacements for two 5-inch R. F. wire-wound guns.

1900. \$17,473 allotted, and \$3,600 transferred from other allotments. Work begun in January; platform built separate from magazines. Battery completed, except setting base rings not received; whitewashing the rooms. 1900, 987.

South side of bay—Emplacements for two 15-pounder R. F. guns.

1900. Site selected and plans and estimates prepared for 2 emplacements on balanced-pillar mounts, 1900, 988.

South side of bay—Emplacements for two 12-inch guns on disappearing carriages.

1900. \$114,000 allotted. Work begun in Sept., 1899. Necessary buildings erected, excavation and roadway completed, water-supply system installed, about 35 acres of the barren sand dunes planted with bunch grass (*Arundinaria*), 4,000 young eucalyptus trees bought and planted. Concrete work begun in February and completed in March; electric-light plant installed, ammunition hoists and trolleys erected and all work completed, except setting base rings, base rings to arrive. Description of excavation work, erection of plant, mixing concrete, water-supply system, placing sod and planting trees on the sand dunes, placing tiling, with complete itemized cost of all work. 1900, 992.

South side of bay—Emplacements for sixteen 12-inch mortars.

1900. \$175,000 allotted. Work begun Nov. 27, 1899. Excavation completed, 68,300 c. y. removed, concrete work begun and 8 platforms finished. Sewers and drains laid. Description of excavation work and of placing concrete. 1900, 1002.

Island in harbor—Emplacements for two 5-inch R. F. wire-wound guns.

1900. \$20,093 allotted. Battery site occupied by 3 emplacements for 8-inch converted rifles; rifles and carriages on hand but not mounted, also 10 old cannon. These were removed by the artillery. Work begun Jan. 27 on excavation. 5,310 c. y. removed; 1,296 c. y. concrete placed. No large stone was placed in roofs of magazines. Concrete retaining wall built to the left and slightly in front of gun No. 2, to prevent further disintegration of the original bank. All machinery installed and work completed except whitewashing the interior walls. Emplacements ready for guns. Description of work with itemized cost. 1900, 1008.

Miscellaneous.

Electric plant.

1899. \$13,300 allotted, and \$2,718.74 transferred from other works. Plans prepared. 99, 982.

1900. Emplacements Nos. 6 to 19, inclusive, to be divided into 3 groups, with a dynamo room and switch board complete for each group. All work completed under contract for \$8,814. Description of dynamos. 1900, 991.

Preservation and repair.

1897. Slopes of mortar battery No. 1 repaired, 4 platforms for 8-inch converted rifles nearly finished; minor work, 97, 750.

1898. 4 platforms for 8 converted rifles completed and armed; \$3,700 allotted; work begun on 10 others; 3 built on north side of bay and 3 on an island in the bay. On the island the old timber magazine was repaired. 98, 786.

1899. \$5,375 allotted. General care and preservation. 99, 989.

1900. \$6,480 allotted. General care and preservation. 1900, 1005, 1010, 1015.

Range and position finders.

1898. Shelter of Lewis range finder—gossamer cloth provided, 98, 788.

1899. \$18,000 allotted for building 13 range-finder shelters of type A and 11 of type B. On south side of bay—1 shelter completed and work on 4 others; work

SAN FRANCISCO, CAL.—Continued.

suspended owing to changes of sites. Piers of emergency range finder, type B, near emplacements 10 and 16, completed. At another point 1 pier built and work completed for another finder. On north side of bay—excavation made for 2 piers and concrete work completed, awaiting the roofs. Work suspended owing to change of sites. 99, 989.

1900. North and south sides of bay—2 partly completed range-finder shelters that could be utilized for the new system were completed; 2 more stations completed; itemized cost of work, 1900, 1015, 1016.

Sea walls and embankments.

Fort Point.

Excavation for sea wall completed, construction in progress; bulkhead for protection of roadway built; minor work, 68, 20. Sea wall 600 f. long completed; work begun on an apron of masses of rock in front of the channel sides of the fort, 69, 20. Apron 709 f. long in front of the sea wall on the channel fronts completed, 3,600 t. of stone used, 70, 27.

Sites.

Point Lotos.

Proceedings in progress for 54.05 acres, 92, 10.

South side of bay.

\$40,000 allotted. Proceedings in progress, 1900, 1003.

Submarine mines.

1891. 2 mining casemates completed, work begun on excavation for another one, 91, 8.

1892. Mining casemate completed, and storage shed erected, 92, 8.

1893. \$7,590 allotted. Work begun, excavation and concrete work completed, and casemate nearly finished. Itemized cost of work. 93, 623.

1894. Mining casemate completed, 94, 11.

1897. \$8,000 allotted for a torpedo casemate, 97, 745.

1898. Work begun on torpedo casemate in July, 1897, and completed in Nov., 1897. Overhead traveler installed in the cable tank, and 1 in the torpedo shed. 98, 795. \$47,000 allotted for torpedo defense, material purchased and first mine planted, June 11, 1898; 42 mines were placed, 98, 796.

1899. \$150,000 allotted for purchasing electric-light materials; no funds used. \$1,785 allotted for repairs of car tracks that were injured by storm; rock revetment built alongside to protect it from further damage. 99, 991. \$3,000 allotted for casemate No. 2, completed under contract. \$2,000 allotted for an additional brick engine house at this casemate; work completed under contract. \$3,500 allotted for an additional cable tank and torpedo station; work completed. Laying of mines continued till July 16, but laying of cables continued, and the entire first line of mines across the bay was completed on Aug. 13. All mines and cables removed from water, cleaned and stored; work completed in November; itemized cost of work. 99, 991, 992.

1900. \$600 allotted for pay of keeper and expenses of torpedo station; racks erected, completing the torpedo shed. Additional cable tank at the torpedo station completed. 1900, 1017, 1018.

Supplies for seacoast defenses.

1900. \$1,000 allotted. No expenditure. 1900, 1017.

Survey for land defenses.

1866-68. Survey in progress, 67, 15; 68, 20.

SAVANNAH. (See *Georgia and Cumberland Sound.*)

SAVANNAH RIVER, GA. (See *Georgia and Cumberland Sound.*)

SCAMMEL. (See *Maine Coast.*)

SCHUYLER. (See *New York Harbor.*)

SEWELL. (See *Boston Harbor, Mass.*)

SHIP ISLAND. (See *Mobile and Mississippi Sound.*)

SOUTH CAROLINA.

Contracts.

1896. Two emplacements for 10-inch guns, \$110,813.56, **97**, 698.

1897. One emplacement for 10-inch rifle, \$66,612.80, **98**, 700.

1898. Ammunition hoist, \$1,950; trolley system, \$2,355, **98**, 702. Electric-light plant, \$5,542, **99**, 860.

Engineering features.

Borings, description of, **96**, 503.

Briquettes, method of making, **96**, 507.

Cement, tests, **96**, 505.

Concrete, placing with traveling derrick, **99**, 866.

Materials, itemized cost, **96**, 512.

Planes of weakness, effects of settlement, **96**, 693.

Plant, construction; arrangement of, **96**, 694; **98**, 705.

Plant, briquette-making, **96**, 516.

Plant, construction, itemized cost, **96**, 512.

Plant, electric, description, **1900**, 915.

Plant, stone-crushing (tracing), **96**, 516.

Quarry and plant, description and cost, **96**, 512.

Settlement of mortar battery, **1900**, 911.

Waterproofing, unsuccessful, **1900**, 912.

Well, artesian; strata passed, **96**, 504.

Well-points, description of, **96**, 509.

Engineers.

CHIEF OF ENGINEERS. Reports, **66**, 14; **69**, 16; **70**, 23; **71**, 19; **72**, 16; **73**, 17; **74**, 20; **75**, 21; **76**, 22; **77**, 18; **78**, 21; **79**, 25; **80**, 42; **81**, 42; **82**, 39; **83**, 35; **84**, 41; **85**, 34; **86**, 34; **92**, 8; **93**, 9; **94**, 13; **95**, 10; **96**, 17; **97**, 16, 675; **98**, 24, 697; **99**, 28, 859; **1900**, 24, 911.

BOARD OF ENGINEERS. Constituted 1882 to consider and report upon the condition of fortifications, and what number if any could be dispensed with. Report, **82**, 422.

ENGINEERS IN CHARGE:

Col. Q. A. Gillmore, 1870-86.

Capt. J. C. Post, 1883.

Maj. F. V. Abbott, 1893-1898.

Lt. E. R. Stuart, 1898.

^a List of works as arranged under this head—

Charleston Harbor, S. C.—Fort Sumter.

Charleston Harbor, S. C.—Castle Pinckney, Shute's Folly Island.

Charleston Harbor, S. C.—Fort Moultrie, Sullivan Island.

Charleston Harbor, S. C.—Fort Johnson, James Island.

Charleston Harbor, S. C.—Lift battery for 3 12-inch rifles.

Charleston Harbor, S. C.—Mortar battery.

Charleston Harbor, S. C.—Ten-inch battery.

Charleston Harbor, S. C.—Twelve-inch battery.

Charleston Harbor, S. C.—4.7-inch R. F. guns.

Charleston Harbor, S. C.—6-inch R. F. gun on pedestal mount.

Port Royal, S. C.—R. F. guns.

Port Royal, S. C.—Siege battery.

Port Royal, S. C.—Ten-inch battery.

Port Royal, S. C.—Eight-inch rifles.

Georgetown, S. C.—Batteries.

Charleston Harbor, S. C.—Three emplacements for 15-pounder R. F. guns.

Charleston Harbor, S. C.—Emplacement for 6-inch R. F. gun on disappearing carriage.

Maj. E. H. Ruffner, 1898-1900.

Capt. J. C. Sanford, 1900.

ASSISTANTS:

Lt. E. H. Schulz, 1896-1900.

Lt. E. R. Stuart, 1897-98. Report, **97**, 690.

Lt. H. B. Ferguson, 1898.

Lt. C. Keller, 1898-99.

Forts and batteries.^a—Operations.

Charleston Harbor, S. C.—Fort Sumter.

1899. Work begun, **80**, 42.

1866. Fort a mass of ruins, **66**, 14.

1870. Modification plans approved for armament of heavy guns in barbette; estimate, \$87,000. Work begun removing old wooden bomb proofs and galleries; temporary Sallyport excavated on west front, and wooden dock built; foundations of new scarp wall on southeast face prepared; casemate arches of second tier, west face, removed, and a large amount of filling placed on parapets of several fronts; minor work. **70**, 23.

1871. \$25,000 appropriated. Sand parapets raised about 7 f. along entire length of north face. **71**, 19.

1872. \$35,000 appropriated. Scarp wall of east half of gorge and the entire southeast face built; broken arches in rear removed and site leveled; surface magazine built on southeast face; casemates of northeast face uncovered; those of second tier of this face were removed and scarp wall cut down; middle casemates uncovered and sites of 2 15-inch guns prepared; 2 cisterns of 2,700 and 3,500 gallons capacity, respectively, built. **72**, 16.

1873. \$40,000 appropriated. Parapet on eastern face and for a length of 57 f. on the gorge face completed. Northeast face—flagging over casemate arches removed and scarp wall cut down to proper height; 10 casemate arches strengthened and 12 retaining walls built, and minor work. **73**, 18.

1874. \$20,000 appropriated. Repairs to 11 of the casemates completed

SOUTH CAROLINA—Continued.

and 11 guns mounted; one retaining wall built and earth filling in rear completed; minor work; raising scarp wall of northeast and northwest faces, and casemate arches of northeast face covered with concrete; 2 barbette service magazines built; terreplein of northeast face completed; timber gun platforms for 15-inch guns laid, and minor work. 74, 21.

1875. Old wooden bombproof galleries excavated and removed, arches of 11 casemates strengthened and asphalted, 4 retaining walls built in rear of these casemates; masonry of new sallyport front and gallery, the barbette service magazine, the foundations for platforms for guns Nos. 1, 2, and 3 on northwest front, and the passage ways through parades in the angles between that front and the adjoining front completed; 2 cisterns, capacity 10,000 gallons each, built; one platform ready for gun, and minor work. 75, 21.

1876. Storage magazine, breast height walls, and permanent platforms for guns Nos. 1, 2, and 3, completed; entire scarp wall of northwest and gorge fronts coped with concrete. Minor work. 76, 22.

1877. Timbers of platforms 9 and 10 stored. Slopes repaired; minor work. 77, 18.

1878. Wharf extended 30 f. Two 15-inch guns and 2 200-pounder Parrott rifles mounted on 15-inch timber platforms. 78, 22.

1879. Preservation and repair—covering of marsh grass placed over the unfinished roof-surface of the principal magazine, 79, 25.

1880. History, and importance of work, 80, 42.

1881. Replacing with a timber revetment the old marsh sod revetment in front of guns 6 and 7 on the northeast face, and guns 9 and 10 on the southeast face; beginning the extension of the wharf, 81, 43.

1882. Parapet repaired, storage magazine covered with marsh grass, new wharf built about 350 f. long; minor work, 82, 40.

1883. Cribbs of new wharf filled with riprap. Sand removed from the casemates of the northeast front, from the galleries, and from the passages leading to magazines; temporary wooden doors made and hung. Slopes and quarters repaired. 83, 36.

1884. Timber breast-height walls for guns Nos. 8 and 9, southeast face, repaired; coping placed for all entrances of covered passages of the northwest face; chimneys raised; cisterns, slopes, and quarters repaired, 84, 42.

1885. Buildings repaired, superstructure of wharf strengthened, and slopes repaired, 85, 35.

1886. Preservation and repair—slopes, wharf, and earthwork repairs, 85, 35.

Charleston Harbor, S. C.—Castle Pinckney, Shute's Folly Island.

1829. Work begun, 80, 43.

1866. Masonry was covered, during the rebellion, with sand and made into a powerful earthwork, 66, 14.

1870. Recommendation approved that the existing condition be temporarily maintained with moderate repairs, and that guns of medium size be mounted on wooden platforms in the several emplacements already prepared for them, 70, 23.

1880. In its existing condition the work useless for defensive purposes; in charge of the Light-House Board for light-house purposes, 80, 43.

Charleston Harbor, S. C.—Fort Moultrie, Sullivan Island.

1841. Work begun, 80, 42.

1866. Fort converted by the Confederate forces during the rebellion into a powerful earthwork. Armament inadequate for modern defense. 66, 14.

1870. Modification plans approved for guns of largest caliber; estimate, \$50,000, 70, 23.

1871. \$25,000 appropriated, 71, 19.

1872. \$35,000 appropriated. Removal of old platforms, flagging of terreplein, the breast-height parade, tie walls, palmetto crib traverses on the terrepleins, and the heavy wooden bombproofs on the parade and adjacent to the scarp wall; scarp wall uncovered and repaired; 3 service magazines in the south, southeast, and southwest faces completed, except doors; and the foundation and platform for 2 15-inch guns laid. The bricks from Confederate Fort Ripley were transferred to this fort. 72, 16.

1873. \$40,000 appropriated. Brick coping of scarp wall on the 3 channel fronts built; masonry of principal, and the adjacent service magazine on the east face finished; earth filling of parapet and traverses, on the 3 channel fronts, nearly finished. All brick and concrete work of the 2 small flanking bastions of channel front removed; minor work. 73, 17.

1874. \$20,000 appropriated. Masonry of northeast bastion magazine completed; wing walls, lintels, and caps added to 3 other service magazines; earth covering placed for the first, second, and third magazines; concrete masonry of the bombproof gallery east of sally-port completed; sally-port gallery raised; terreplein in

SOUTH CAROLINA—Continued.

rear of guns graded; work on paradocs; platforms for 4 of the largest sea-coast mortars laid in rear of fort, and mortars mounted. Minor work. 74, 21.

1875. \$15,000 appropriated. Work on parapet on southwest and west fronts and southwest angle; sally-port on gorge face completed, and masonry of the sally-port and casemates and sally-port gallery nearly completed; sand covering of old storage magazines removed, drain repaired; 7 platforms ready for guns; minor work. 75, 21.

1876. Old storage magazine remodeled, and a service magazine, permanent platform, and breast-height wall for gun No. 12 completed; postern front completed, and foundation walls of the galleries leading to it were raised; minor work. 76, 22.

1877. Preservation and repair, 77, 18.

1878. Preservation and repair. Two 15-inch guns mounted on timber platforms. 78, 21.

1879. Preservation and repair, 79, 25.

1881. Exposed concrete over the sally-port and guard rooms covered to protect it from the weather; general repairs of quarters and fences, etc., 81, 42.

1882-83. Wooden covering placed on principal magazine, repairs of quarters and grounds, 82, 39; 83, 36.

1884. Slopes repaired, graded, and sodded, and fort keeper's house repaired. 84, 41.

1885. Preservation and repairs—fences and slopes, 85, 34.

Charleston Harbor, S. C.—Fort Johnson, James Island.

1870-74. Modification plans approved—to be repaired and maintained as an earthwork with such alterations and enlargements as will adapt the emplacements of 15-inch guns, 70, 23. Approved projects, 74, 22.

1876. Four 13-inch mortar platforms on hand, 76, 23.

1880. Description of this work; a fort only in name, having neither armament nor magazines, 80, 43.

Charleston Harbor, S. C.—Lift battery for three 12-inch rifles.

1895. \$75,500 allotted, 95, 11.

1896. Work begun 1895. 1,500 t. large stone procured for \$393. Borings made; wharf built by contract. Artesian well bored under informal agreement; cost, \$896.64. Work begun on scarp wall, and completed. Total cost, \$3,299.90. Work suspended, and funds transferred to the mortar battery. 96, 502.

Charleston Harbor, S. C.—Mortar battery.

1896. \$60,000 transferred from 12-inch emplacements, and \$42,222 allotted. Work begun in March. Borings made, canal and basin dredged; wharf built, and 5 bins for stone constructed. Pile driving begun Apr. 20, 1896; 330 piles driven by the end of the year, completing the piling for 7 mortar platforms. 7 mortars and carriages received. Excavation for mortar pits begun; ground drained of water with well-points. 96, 508.

1897. \$112,000 allotted. Concrete work begun, and 15,562 c. y. placed; 107,816 c. y. sand placed in parapet and covered with 9,000 c. y. mud; 1,388 s. y. sod placed round the tops and on the steep slopes. 1 mortar and 5 carriages received, and 8 mortars and 16 carriages mounted. 97, 675.

1898. \$7,000 allotted. Concrete ramps in pits finished and 3 inches of granolithic covering placed; all floors put in; magazine doors built; settlement continued; mortars releveled; remaining 8 mortars received and mounted. 98, 697.

1899. Slopes graded, floors of interior galleries, shell rooms, and recesses raised 6 to 9 inches. Completed battery turned over to the artillery. 99, 859.

1900. Total settlement of battery to Nov., 1899, 1.49 f. at north end, 1.66 f. at south end, and 1.47 f. in middle. Floors of magazine raised about 1 f. Wire fence built on 3 sides of reservation. 1900, 911.

Charleston, S. C.—Ten-inch battery.

1897. \$160,000 allotted. Plans approved for shifting battery 400 f. west of site selected by Board of Engineers. Battery to be built under contract. Artesian well begun. Concrete work and sand filling in progress. Shot lifts in position. No armament. 97, 693.

1898. \$75,000 allotted. 3 guns and carriages received and mounted. Artesian well, 1,308 f. deep, dug, and 3 gun emplacements completed, except electric plant. Work begun, under contract, on a fourth emplacement completed. 98, 698.

1899. \$3,100 allotted; electric plant installed and completed and turned over to the garrison. \$1,610 allotted for construction of two cisterns each to contain 30,000 gallons of water; work begun and completed. 99, 860, 861.

Charleston Harbor, S. C.—Twelve-inch battery.

1898. \$50,000 allotted Mar. 18. Work begun on 1 emplacement for a 12-inch disappearing gun on U. S. carriage,

SOUTH CAROLINA—Continued.

model 1896. Platform ready for base ring by May 14. On Apr. 25, \$40,000 allotted, work begun on 1 emplacement for a 12-inch barbette carriage; platform nearly completed. 400 c. y. Portland and 2,500 c. y. natural cement placed. No armament on hand. 98, 700.

1899. \$7,200 allotted for the emplacement for disappearing carriage. Total of 11,000 c. y. concrete placed in both emplacements; shot lifts, and trolleys erected, 2 cisterns built under loading platforms in spaces which would otherwise have been filled with sand; retaining wall built behind both emplacements to the height of the loading platform. \$1,600 allotted for mounting guns and carriages. Barbette gun and carriage mounted, disappearing gun carriage mounted; gun not yet received. Battery completed, except electric lighting and erection of cranes and hand railing. Minor repairs made. 99, 863, 864.

1900. 12-inch rifle for disappearing carriage received and mounted. \$5,000 allotted, and electric-light plant installed. Battery turned over to the artillery. 1900, 914.

Charleston Harbor, S. C.—4.7-inch R. F. guns.

1898. \$6,000 allotted Apr. 6 for 2 emplacements. Work begun, and 2 emplacements and 1 magazine, except roof, completed by May 1. 98, 702.

1899. Completion of gallery and drains; mounting guns; covering parapet with an apron of 6-inch concrete. Completed battery turned over to the artillery. 99, 861.

Charleston Harbor, S. C.—Six-inch R. F. gun on pedestal mount.

1898. \$8,000 allotted for 1 emplacement, 98, 703.

1899. \$7,500 allotted. Work begun in Oct., 1898, and completed. Gun and carriage mounted by artillery. 99, 861.

Port Royal, S. C.—R. F. guns.

1898. \$6,000 allotted Apr. 6 for 2 4.7-inch R. F. guns; work begun; 530 c. y. concrete placed, and guns and mortars mounted by June 24, 98, 704.

1899. Grounds graded; parapet protected with oyster shells, and battery completed, 98, 868.

Port Royal, S. C.—Siege battery.

1898. \$2,000 allotted for temporary battery for 1 5-inch B. L. siege gun and 1 7-inch B. L. siege Howitzer. Work begun and completed, ready for mounting the guns which were on hand. Orders received to ship them to Tampa, Fla.

Two light 12-pounders received and mounted on wooden platforms, so as to fire over parapets. One of the magazines is used as a mining casemate and the other for storage purposes. 98, 704.

Port Royal, S. C.—Ten-inch battery.

1898. \$89,000 allotted. Work begun on 2 emplacements and 454 c. y. concrete placed in gun blocks, completing same. 98, 705.

1899. \$50,000 allotted. Work begun on an additional emplacement, 11,010 c. y. concrete and 14,500 c. y. sand placed; ammunition hoists and trolley systems installed, and 2 carriages mounted. 99, 865.

1900. Remaining carriage and 3 rifles mounted by artillery; cranes erected, hand railing put up, barbed-wire fence built, electric plant installed and tested. Completed battery turned over to the artillery. 1900, 915.

** Port Royal, S. C.—Eight-inch rifles.*

1898. \$12,000 allotted for temporary battery for 2 8-inch rifles mounted on 15-inch carriages. Site changed. Work begun on wharf. 98, 706.

1899. Guns mounted and all work completed, 98, 869.

Georgetown, S. C.—Batteries.

1898. \$5,000 allotted. Temporary batteries for 2 7-inch B. L. howitzers built, requiring the use of 6,000 sand bags and 1,500 c. y. sand to fill in between the walls; emplacement built and howitzer mounted. Two 5-inch B. L. rifles mounted in the old fort prepared for them. Orders received to ship all ordnance and ordnance stores at Georgetown to Tampa, Fla. These guns were replaced by 4 12-pounder guns, which were mounted. 98, 766.

1899. 12-pounder guns removed, 99, 870.

Charleston Harbor, S. C.—Three emplacements for 15-pounder R. F. guns.

1899. \$9,500 allotted. Work begun removing an old 15-inch gun, 750 c. y. sand, and 140 c. y. of old concrete. Battery completed except setting base castings. 99, 861.

1900. Guns, carriages, and base casting not yet received, 1900, 913.

Charleston Harbor.—Emplacement for 6-inch R. F. gun on disappearing carriage.

1899. \$20,000 allotted. Work begun in April, and 635 c. y. concrete placed in walls and 450 c. y. sand placed in parapet. 99, 862.

SOUTH CAROLINA—Continued.

1900. 1,100 c. y. concrete placed, and 2,400 c. y. sand for parapet. Carriage received and mounted. Battery completed, except mounting gun, and turned over to the artillery. 1900, 913.

Preservation and repair.

1898. Charleston Harbor—\$1,800 allotted for mounting 15-inch S. B. guns on emplacements 5, 6, 7, and 8 of old fort, 2 guns mounted, 98, 703.

1899. Charleston Harbor—\$1,500 allotted for painting I-beams, and repairing shot lifts and drains of 10-inch battery, 99, 862. \$382.46 expended on minor repairs of 12-inch emplacement, 99, 864.

1900. Charleston Harbor—\$3,800 for repairs of electric plant, building wire fence, prevention of leakage in magazines (unsuccessful), and minor work on plant. \$500 allotted for caring for torpedo material, building a dust-proof room for torpedo material, and minor work. 1900, 912, 913. \$500 allotted for completing guard rail, erecting cranes, and building wooden sheds over passages to keep out the rain, 1900, 914.

Port Royal—\$2,500 allotted for repairs of wharf, 126 piles protected by yellow metal driven, work completed, 1900, 915. \$500 allotted for repairs of torpedo material, work completed. 1900, 916. \$200 allotted for establishing a bench mark, work completed, 1900, 916.

Range and position finders.

Charleston Harbor, S. C.

1896. Station built in rear of the mortar battery. 96, 517.

Sites.

Sullivan's Island.

Secretary of War requested the cooperation of the governor of North Carolina in obtaining the passage of an act ceding the title to, and jurisdiction over, the

sites of these 3 batteries to the U. S., 91, 13. Title granted to the U. S. on condition that the U. S. compensate all persons having any right, title, or interest in any part of the land in question, 95, 14. 21 lots purchased at cost of \$31,332. Negotiations in progress for remainder of the land. 96, 17. Title to all land acquired for 10-inch and 12-inch batteries, except 4 lots, which were condemned, papers awaiting the opinion of the Attorney-General, 97, 17. \$2,175 allotted for purchasing sites. 1900, 916.

Submarine mines.

1892. Charleston Harbor—one mining casemate nearly completed, 92, 8.

1893. Charleston Harbor—mining casemate completed; cost, \$13,100, 93, 9.

1898. Charleston Harbor—cable tank built at mortar battery. Mines planted, kept in order and mine fields patrolled. 98, 25, 698.

1899. Charleston Harbor—\$5,000 allotted. All mines removed by exploding them; material cleaned and stored. 24-inch search-light outfit transferred to the engineer officer. \$1,900 allotted for a new mining casemate, the existing one found to be unsuitable, accomplished by converting an old magazine in the fort; additional cover obtained by placing concrete and sand. 99, 865.

Port Royal Harbor—mines planted July 28, and removed by exploding them in August; material stored. \$3,000 allotted for cable tank; work begun and completed, and a movable hoist installed. 99, 869.

1900. Charleston Harbor—200 c. y. sand and 200 c. y. marsh mud placed on slopes, 1900, 914.

Port Royal—drums of cable removed from cable tank, tested, insulated, and replaced, 1900, 915.

SOUTH CLIFF BATTERY. (See *New York Harbor.*)

STANDISH. (See *Boston Harbor, Mass.*)

STATEN ISLAND. (See *New York Harbor.*)

STEVENS. (See *Columbia River.*)

STONINGTON. (See *Eastern entrance to Long Island Sound and coast of Connecticut.*)

SULLIVAN ISLAND (FORT MOULTRIE). (See *South Carolina.*)

SUMTER. (See *South Carolina.*)

TAMPA BAY, FLA.

Contracts.

1899. Portland cement, \$2.75 per barrel. Random and crushed stone, \$2.66 per c. y. 99, 911.

Engineering features.

Anchor plates, method of supporting, 99, 902; 1900, 935.

Cable tank, description and cost, 99, 904.

Concrete, cost per c. y., 99, 908, 911; 1900, 932, 935. Description of, 99, 902. Mixing, 99, 906.

Plant, electric light, 1900, 931, 932, 934, 937.

Materials and labor, itemized cost of, 1900, 932, 933, 935.

Materials, quantities, 99, 900; 1900, 930.

Engineers.

CHIEF OF ENGINEERS. Reports, 98, 718; 99, 29, 899; 1900, 26, 929.

ENGINEERS IN CHARGE:

Lt. Col. W. H. H. Benyard, 1898-99.

Capt. H. Jervy, 1899-1900.

Capt. T. H. Rees, 1900.

ASSISTANTS:

Lt. R. P. Johnston, 1898-99.

Capt. W. W. Harts, 1898-99.

Lt. E. M. Markham, 1899.

Lt. F. Boggs, jr., 1899-1900.

Forts and batteries. a—Operations.

Temporary batteries.

1898. \$14,900 allotted. Work begun Apr. 26; both completed by June 30, constructed of timber and sand; guns and howitzers mounted in position June 1. 98, 718.

1899. One 5-inch gun dismounted and turned over to Gen. Rodgers, U. S. V. In January, 1899, work turned over to the troops. 99, 899.

Emplacements for two 8-inch B. L. rifles on strengthened 15-inch barbette carriages.

1898. \$29,500 allotted. Plans approved and material ordered. 98, 719.

1899. \$4,000 allotted. Work begun in July, 1898, and completed in Dec., 1898; and guns mounted. Battery turned over to the troops. Entire cost, \$32,503.04. Description of work done. 99, 899.

Emplacement for two 6-inch R. F. guns.

1898. \$29,600 allotted. Plans approved and material purchased. 98, 719.

a List of works as arranged under this head—
Temporary batteries.
Emplacements for two 8-inch B. L. rifles.
Emplacement for two 6-inch R. F. guns.

1899. \$5,000 allotted. Work begun in July and completed December, 1898. Guns mounted and battery turned over to the troops. Ammunition service provided. Description of work. 99, 900.

Emplacement for eight 12-inch mortars.

1899. \$150,000 allotted. Work begun; dock built; all gun beds completed, and anchor bolts set. 2 mortar carriages received. Description and cost of work to date. 99, 905.

1900. \$5,651.98 allotted. All emplacements completed; 8 carriages mounted, and battery turned over to the artillery command. Electric-light plant installed; description of plant. Itemized cost of labor and materials. Summary of work. 1900, 930.

Two emplacements for 8-inch guns on disappearing carriages.

1899. \$97,500 allotted. Work begun; dock built; necessary buildings erected; 1,518 c. y. concrete placed, shell used in concrete masonry. Description of work, with tracing showing arrangement of plant. 99, 908.

1900. \$21,449.53 allotted. Battery completed, and turned over to the artillery command; 1 8-inch carriage received and mounted, and the other carriage received and turned over to the troops for mounting. Electric-light plant installed. Description. Details of work, with cost. 1900, 933.

Preservation and repair.

1900. \$1,227 allotted for inspecting, cleaning, moving, and protecting submarine mine material, and repairing dock. All the work completed. 1900, 936.

Submarine mines.

1898. \$16,300 allotted for purchase of explosives, laying mines, and patrolling mine fields. No mines planted. 98, 720.

1899. \$4 allotted. Storage shed built and materials stored. 2 tons dynamite, purchased when orders for planting mines were first received, burned. 99, 903. \$5,725 allotted for cable tank, which was completed, except the traveling crane. Description of tank with cost. 99, 904.

1900. Cable tank traveling crane installed, 1900, 929. All material inspected, cleaned, and stored. 1900, 936.

List of works as arranged under this head—
Emplacement for eight 12-inch mortars.
Two emplacements for 8-inch guns.

TAYLOR. (See *Florida.*)**TOMPKINS.** (See *New York Harbor.*)**TORTUGAS, FLA.** (See *Florida, East Coast, and Key West.*)**TOTTEN.** (See *Post of Fort Totten.*)**TOWER DUPRES, LAKE BORGNE, LA.** (See *New Orleans, La., and Sabine Pass, Tex.*)**TRUMBULL.** (See *Long Island Sound.*)**TYBEE ISLAND, GA.** (See *Georgia and Cumberland Sound.*)**U. S. MASTIC WORKS ON GOVERNORS ISLAND, NEW YORK HARBOR.****Engineers.**

CHIEF OF ENGINEERS. Reports, 80, 62; 81, 63; 82, 62.

ENGINEER IN CHARGE. Col. J. Newton, 1880-82.

Operations.

1880. 236,170 lbs. mastic and 65,760 lbs. bitumen procured some years since for covering the arches of casemates of for-

tifications. This material was transferred Jan. 24 to the post quartermaster on Governors Island for storage, subject to requisition. 80, 62.

1881. 1,980 lbs. of mastic and 4,275 lbs. of bitumen sold to officers for public works, 81, 63.

1882. 9,447 lbs. of mastic and 1,669 lbs. of bitumen sold to officers for public works, 82, 62.

WADSWORTH. (See *New York Harbor.*)**WARREN.** (See *Boston Harbor, Mass.*)**WASHINGTON, D. C.****Contracts.**

1896. Small stone, \$1.88 per c. y.; granolithic stone, \$2.08 per c. y.; brick, \$12 per thousand; Rosendale cement, 99½ cents per barrel; Portland cement, \$2.37 per barrel, 96, 490.

1897. Rosendale cement, 4,000 barrels, 84½ cents per barrel, 97, 652; 2 emplacements for 8-inch guns, including wharf, \$58,683.96, 97, 653.

1898. Natural cement, 4,000 barrels, 61 cents per barrel; sand, 1,000 c. y., 40 cents per c. y.; pebbles, 1,000 c. y., 59 cents per c. y.; riprap stone, 1,300 c. y., \$1.35 per c. y.; broken stone, 1,550 c. y., \$1.50 per c. y., 98, 672; electric light and power plant, \$7,683.92; I-beams, 1,423 pounds, 2½ cents per pound, 98, 674, 678.

1900. Rosendale cement, 5,000 barrels, at \$1.12½ per barrel, 1900, 881.

Engineering features.

Concrete, settlement of, 1900, 877.

Experimental parapet, 98, 668; 99, 826; 1900, 880.

Waterproofing, 98, 669.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, 13; 67, 12; 68, 15; 69, 14; 70, 21; 71, 17; 72, 14; 73, 15; 74, 18; 75, 19; 76, 20;

77, 16; 78, 19; 79, 23; 80, 39; 81, 38; 82, 35; 83, 31; 84, 36; 85, 29; 86, 29; 91, 5; 92, 7; 93, 8; 94, 10; 95, 9; 96, 16, 490; 97, 15, 650; 98, 22, 667; 99, 24, 822; 1900, 22, 876.

BOARD OF ENGINEERS.

Constituted, 1882, to consider and report upon the condition of fortifications, and what number, if any, could be dispensed with. Report, 82, 421.

Report, 1887, 87, 11; 89, 6.

ENGINEERS IN CHARGE:

Maj. B. S. Alexander, 1866.

Maj. J. A. Tardy, 1867.

Col. H. Brewerton, 1868.

Maj. N. Michler, 1870.

Lt. Col. J. D. Kurtz, 1870.

Lt. Col. W. P. Craighill, 1870-83.

Capt. C. B. Phillips, 1878.

Capt. T. Turtle, 1883.

Lt. Col. P. C. Hains, 1883-92.

Maj. L. C. Overman, 1892.

Capt. T. Turtle, 1892.

Maj. C. E. L. B. Davis, 1892-96.

Lt. Col. J. C. Allen, 1896-1900.

ASSISTANTS:

Lt. G. A. Zimm, 1892-94.

Lt. D. DuB. Gaillard, 1895-96.

Lt. G. P. Howell, 1896-97.

Lt. J. J. Morrow, 1897-99.

WASHINGTON, D. C.—Continued.

Forts and batteries. ^a—Operations.

Fort Washington, Potomac River, Md.

1816. Work begun, 80, 39.

1866. The necessary ameliorations to be considered by Board of Engineers, 66, 13.

1870. Importance of fort. Modification plans being prepared. 70, 22.

1871. Observations made for determining the direction and force of the surface and subsurface currents, for use in placing explosives, 71, 18.

1872. \$21,000 appropriated. Projects of earthen barbette batteries immediately north and south of main work, as well as modification plans of existing water battery, prepared. 72, 15.

1873. \$25,000 appropriated. Work begun in March on removal of old demilune not required by new plans; completion of exterior supporting bank of earth for sand parapet; excavations for traverse magazines made, and some concrete work. 73, 16.

1874. Work on demilune, masonry of traverse magazines, and embankments; 2 platforms between traverse magazines completed, and work on other platforms. Title to an adjoining 300-acre tract nearly perfected. 74, 19.

1875. Pintles set in 4 new platforms; minor work and repairs; adjoining tract of land purchased. Survey of entire territory completed. 75, 19.

1876. Repairs of wharf, crib work, and minor repairs, 76, 20.

1877. Repair of bridge at sally-port entrance, wharf, fences, and crib work, 77, 16.

1878. Revised project prepared. Repairs of wharf and roofs of 2 principal magazines. 78, 20.

1879. Repair of wharf, etc., 79, 24.

1880-85. Preservation and repair, 80, 39; 81, 39; 82, 37; 83, 32; 84, 37; 85, 30.

1886. Traverse rails and pintle plates for 4 15-inch gun platforms laid. Repair of slopes, magazines, and fences. 86, 30.

Washington, D. C.—Fort Foote, Potomac River, Md.

1862. Work begun, 80, 39.

1870. Importance of fort. Survey

and minor repairs of ground exterior to the existing works. 70, 21.

1871. Wharf rebuilt. Observations made for determination of the direction and force of the surface and subsurface currents for use in placing explosives. 71, 17.

1872. \$21,000 appropriated. Modification plans approved; arrangements made for purchase of site. 72, 14.

1873. \$25,000 appropriated. Site acquired and work begun in April on completion of wharf and necessary structures for execution of work; earth embankment for new parapet nearly completed. 73, 15.

1874. Work on earth embankments and slopes, drains, masonry in magazines and wing wall; wharf extended; foundations of 4 front pintle gun platforms completed, 74, 18.

1875. Completing platforms; work on masonry of magazines. Land acquired to afford the garrison an outlet to the Piscataway road. 75, 19.

1876. Repairs of crib work and wharf, 76, 20.

1877. Two new front pintle 15-inch gun platforms provided with traverse circles, and a temporary wooden breast height built in front, 77, 16.

1878-85. Preservation and care, 78, 19; 79, 23; 80, 39; 81, 38; 82, 36; 83, 32; 84, 37; 85, 30.

1886. Traverse rails and pintle plates laid for 2 15-inch guns; repair of quarters, roads, and slopes, 86, 30.

Left bank of Potomac River, Md.—Two-gun battery.

1892. \$117,150 allotted, 1891. Plans approved; work begun in September, 1891; wharf built, plant erected, and excavation in progress. 92, 7.

1893. Excavation completed; concrete work begun, 93, 8.

1894. 2 emplacements completed, awaiting decision of details of carriages, 94, 10.

1896. \$20,826 allotted, 1895. Emplacements nearly completed. Total cost to date, \$141,403.03. 96, 16, 491.

1897. Guns mounted and battery completed, 97, 651.

1899. Electric-light plant installed,

^a List of works as arranged under this head—

Washington, D. C.—Fort Washington, Potomac River, Md.

Washington, D. C.—Fort Foote, Potomac River, Md.

Left bank of Potomac River, Md.—Two-gun battery.

Left bank of Potomac River, Md.—Two 10-inch gun emplacements.

Right bank of Potomac River, Va.—Three emplacements for 8-inch guns.

Left bank of Potomac River, Md.—Rapid-fire battery. Two 4-inch Driggs-Schroeder guns.

Left bank of Potomac River, Md.—Two emplacements for 10-inch guns.

Left bank of Potomac River, Md.—Battery E for 8 12-inch mortars B. L. R. on carriages.

Left bank of Potomac River, Md.—Battery for 2 15-pounder R. F. guns.

Left bank of Potomac River, Md.—Battery for 2 6-inch R. F. guns.

Right bank of Potomac River, Va.—Emplacements for 2 6-inch R. F. guns.

Right bank of Potomac River, Va.—Battery for 3 15-pounder R. F. guns.

WASHINGTON, D. C.—Continued.

and repairs of granolithic covering on superior slope, 99, 822.

1900. Battery turned over to the commanding officer, July 6, 1899, 1900, 876.

Left bank of Potomac River, Md.—Two 10-inch gun emplacements.

1896. \$50,000 allotted. Work begun on 1 emplacement. 96, 16.

1897. Emplacement practically completed and gun mounted in May, 1897, on a disappearing carriage, L. F. model, 1894. \$41,500 allotted for another emplacement, which was begun in June; excavation nearly completed. 97, 652.

1898. Gun mounted on a disappearing carriage, L. F. model, 1896, and battery practically completed; minor work required, 98, 667.

1899. Stairs and railways erected; observation station for type B range finder built; cement floor placed in dynamo room; tile partition built between boiler and dynamo room; and electric plant installed, 99, 822.

1900. Battery turned over to the commanding officer, July 6, 1899, 1900, 876.

Right bank of Potomac River, Va.—Three emplacements for 8-inch guns on disappearing carriages.

1897. \$106,125 allotted. Work to be done under contract begun in January. 11,623 c. y. excavated, 5,537 c. y. placed in embankment, drainage system put in. 97, 652.

1898. Wharf completed. Excavation and concrete work completed. \$1,850 allotted for mounting guns and carriages; completed. Method of work described. \$120 allotted; 3 telephone booths built, 98, 676.

1899. Completing details of machinery, doors, roadway; covering the embankment with soil, 99, 832.

1900. Battery turned over to the commanding officer Jan. 13, 1900. 1900, 885.

Left bank of Potomac River, Md.—Rapid-fire battery—Two 4-inch Driggs-Schroeder guns.

1898. \$13,150 allotted. Work begun in May; old magazine removed, concrete floors of both magazines and about half that in walls of one magazine placed; both guns being mounted. 98, 670.

1899. Mounting of guns completed, and battery completed. Summary of work. 99, 824.

1900. Battery turned over to the

commanding officer July 6, 1899. 1900, 876.

Left bank of Potomac River, Md.—Two emplacements for 10-inch guns on disappearing carriages.

1898. \$92,300 allotted. Work begun in March; concrete work two-thirds completed. 98, 670.

1899. \$1,000 allotted. Guns and carriages mounted, and battery completed. Summary of work. 99, 823.

1900. Battery turned over to the commanding officer July 6, 1899. 1900, 876.

Left bank of Potomac River, Md.—Battery E, for eight 12-inch mortars, B. L. R. on carriages, model of 1896.

1899. \$113,000 allotted. Work begun in August 1898; excavation completed. 4,478 c. y. concrete placed and 16,400 c. y. earth placed in embankment. Battery about half completed. 99, 824.

1900. Concrete work on magazines and parapets completed; asphalt covering of magazine placed; no mortars received; base rings to be taken up and leveled. Summary and cost of work. 1900, 877.

Left bank of Potomac River, Md.—Battery for two 15-pounder R. F. guns.

1899. \$9,500 allotted. Work begun in March on excavation and placing concrete. 99, 825.

1900. Work completed, except gun platforms, awaiting arrival of mounts, 1900, 879.

Left bank of Potomac River, Md.—Battery for two 6-inch R. F. guns.

1899. \$59,180 allotted. Work begun in June. 99, 826.

1900. Difficulty in obtaining material; 395 c. y. concrete placed, 3,000 c. y. excavation and embankment made; about 25 per cent of work done, 1900, 878.

Right bank of Potomac River, Va.—Emplacements for two 5-inch R. F. guns.

1899. \$14,500 allotted. Work begun in November, 1898. Excavation and concrete work in progress. Platforms delayed because of nondelivery of the gun mounts. 99, 832.

1900. Works suspended; about three-fourths completed; funds exhausted; no mounts received, 1900, 884.

Right bank of Potomac River, Va.—Battery for three 15-pounder R. F. guns.

1900. \$15,100 allotted. No work done. 1900, 884.

WASHINGTON, D. C.—Continued.

Miscellaneous.

Electric light and power plant—Left bank of Potomac River, Md.

1898. \$8,250 allotted. Work to be done by contract. 98, 670.

1899. Plant installed and tested. Description of plant. Total cost of plant in place, \$7,970.50. 99, 827.

Electric light and power plant—Right bank of Potomac River, Va.

1899. \$9,032.57 allotted. Work begun on power house and cistern; both completed except floor of power house. 99, 833.

1900. House completed ready for engine and boiler. Plant not yet installed. 1900, 885.

Experimental parapets and platform—Left bank of Potomac River, Md.

1898. \$20,250 allotted for building experimental parapets, shield, and platform, and parapet for gun. Work begun in December, nearly completed. 98, 668.

1899. \$1,500 allotted. Gun mounted and work completed. Parapets tested June 29, 1899. 99, 828.

1900. Removing loose concrete so as to trace the path of the projectile, and minor repairs, 1900, 880.

Mounting 10-inch gun en barbette—Left bank of Potomac River, Md.

1898. \$1,750 allotted for mounting for defense the 10-inch gun and carriage sent for experimental firing; platform was built in May, and gun and carriage mounted, 98, 671.

1899. Gun removed from its temporary position and mounted on its platform in readiness for firing at targets, 99, 824.

Washington, D. C.—Potomac River, obstructions of the.

1866-69. Several methods of preparing and establishing suitable obstructions under consideration, 66, 13; 67, 12; 68, 15; 69, 15.

1870-76. Not found practicable to make the desired experiments upon these obstructions; material stored at Fort Foote, 70, 21; 71, 17; 72, 14; 73, 15; 74, 18; 75, 19; 76, 20.

1877. Building in which material was stored, repaired, 77, 16.

1879-80. Repair of buildings, 79, 23; 80, 39.

Washington, D. C.—Telephone booths.

1898. Batteries B and C, \$160 allotted, work completed, and the booths set in place, 98, 670.

Preservation and repair.

1898. 3 buildings repaired for employees, 98, 668. Repairs of mining casemates; strengthening the parapet in front of 15-inch guns; fitting up a field magazine for 15-inch gun. \$175 allotted for dismounting and shipping 2 15-inch guns and carriages. Minor repair of wharf, cisterns, fences, etc., 98, 669. \$500 allotted for purchase of some equipment, painting concrete surface of emplacement, and clearing fronts of guns, 98, 671. Wire fence 5 f. high built around 8-inch emplacement at cost of \$340. 98, 678.

1899. Left bank of Potomac River, Md.: \$6,678 allotted. Roller paths of 2 15-inch S. B. guns taken up and shipped; superior slope injured by firing, repaired; slopes, roadways, drainage, torpedo material, and ammunition lifts, etc., repaired, 99, 830. \$954 allotted for repairs of earth slopes and roadway of Battery G; minor repairs, 99, 834. \$550 allotted for emergency purposes. Right bank of Potomac River: Cutting timber to afford a clear field of fire for the 3 8-inch guns. Work completed. 99, 834.

1900. \$2,892 allotted for emplacements on left bank of river. Searchlight outfits cared for, quarters repaired, and minor work, 1900, 880. \$1,354 allotted for emplacements on right bank of River, repairs of slopes, drains; altering ammunition hoists, and minor work. 1900, 885.

Range and position finders.

1898. Batteries B and C—\$350 allotted for 2 observing stations, work completed, 98, 670.

1899. \$93 allotted for mounting 2 type B range finders, each at Batteries B, C, and D. Work completed in Oct., 1898. 99, 830. \$100 allotted for taking accurate horizontal measurements and making blue prints for location of range finders; work completed, 99, 830. \$3,692 allotted for battery commander's station at Battery D. \$222 allotted for 2 type B range finders at Battery G. Work begun. 99, 833.

1900. \$20,720 allotted for battery commander's station at 10-inch batteries; stations about three-fifths completed, 1900, 879. \$4,259 allotted for battery commander's station near the 8-inch battery; work about 60 per cent finished, 1900, 885.

Sites.

Sheridans Point, below Washington, D. C.

\$13,576.87 paid for 90.6 acres by appraisal, 92, 9; 93, 11.

Submarine mines.

1891. 1 mining casemate being built, 91, 7.

WASHINGTON, D. C.—Continued.

1893. Mining casemate completed; cost, \$15,784.95, **93**, 8.

1898. Cable storage tanks completed, **98**, 667. \$4,900 allotted for a brick storehouse for submarine mine material. Walls and roof completed. **98**, 668. Waterproofing mining casemate, **98**, 669. \$3,500 allotted for purchase of explosives. \$13,725 allotted for planting mines; casemates fitted up and machinery installed; 3 triangulation stations laid out and mines planted. **98**, 675. \$925 allotted for observing tower and range-finding station; completed, **98**, 678.

1899. Cable-storage tank, small addition made to foundation at front of shed,

and a gravel platform built in front of it; minor work, **99**, 827. Storehouse for submarine mine material; floor 1 foot thick built; storeroom for confidential and delicate apparatus built; racks for mine cases put up; sea wall built along river front, and building completed, **99**, 827. \$4,500 allotted for extending the mining casemate; work begun, and excavation nearly completed, **99**, 828. \$9,746 allotted for torpedo defense; all mines and cables removed from river, cleaned, and stored; searchlight operated. Unloading mines described. **99**, 828.

1900. Extension to the mining casemate built in 1891 completed, **1900**, 880.

WILLETS POINT. (See *New York Harbor*.)

WINFIELD SCOTT. (See *San Francisco, Cal*.)

WINTHROP. (See *Boston Harbor, Mass.*)

WOOD. (See *New York Harbor*.)

WOOL. (See *Hampton Roads*.)

YERBA BUENA ISLAND, CAL. (Post).**Engineers.**

CHIEF OF ENGINEERS. Reports, **68**, 22; **69**, 21; **70**, 30; **71**, 28; **72**, 28.

OFFICER IN CHARGE. Capt. S. M. Mansfield, 1868-71.

Operations.

1868. This post and depot were constituted by S. O. 34, dated A. G. O., Feb. 10, 1868, and was first occupied on Mar. 25. Work begun on making roads, clearing, and preparing part of the land for permanent occupation, and improving the supply of water. **68**, 22.

1869. Wharf built and necessary barracks, guardhouse, hospital, and other buildings completed, **69**, 21.

1870. A military survey of the island in progress, **70**, 30.

1871. By G. O. 122, series of 1870, from the War Department, Company D, stationed at this post, was reduced and the skeleton company ordered temporarily to Willets Point. The engineer property was left in charge of a small detachment left for that purpose. On June 30, 1871, this post was transferred, by orders of the Secretary of War, to the Quartermaster's Department. **71**, 28.

1872. Engineer property was destroyed by fire on May 3, 1871. The small detachment of Company D, left to guard it, was ordered to Willets Point. **72**, 28.

STATEMENTS OF APPROPRIATIONS FOR FORTIFICATIONS.

Recapitulation of appropriations for fortifications by States.

Alabama.....	\$1,798,198.87
Arkansas.....	152,707.71
California.....	6,090,000.00
Connecticut.....	360,400.00
Delaware.....	2,485,708.98
District of Columbia.....	1,250,000.00
Florida.....	8,031,490.27
Georgia.....	1,313,808.56
Indian Territory.....	16,000.00
Louisiana.....	3,074,393.21
Maine.....	3,764,120.00
Maryland.....	1,955,505.40
Massachusetts.....	4,098,094.72
Michigan.....	335,000.00
Mississippi.....	555,000.00
New Hampshire.....	1,061,771.00
New Jersey.....	1,356,000.00
New York.....	9,574,957.13
North Carolina.....	1,160,764.59
Pennsylvania.....	278,900.00
Rhode Island.....	2,454,316.67
South Carolina.....	2,070,844.91
Texas.....	285,000.00
Virginia.....	5,032,113.10
Miscellaneous.....	50,195,799.12
Total.....	108,748,894.24

Alabama:

Fort Gaines—	
1825-60.....	\$453,947.78
Fort Morgan, Mobile Point—	
1821-56.....	\$1,317,251.09
Feb. 10, 1875.....	25,000.00
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	1,342,251.09
Total.....	1,798,198.87

Arkansas:

Fort Smith—	
1836-44.....	152,707.71

California:

San Francisco, defenses of. (See <i>Batteries, Pneumatic</i> , under <i>Miscellaneous</i>)—	
1853-65.....	1,027,000.00
Mar. 2, 1889.....	22,000.00
Aug. 18, 1890.....	260,000.00
	<hr/>
	1,309,000.00
Fort Alcatraz—	
1854-65.....	1,295,000.00
June 12, 1866.....	90,000.00
Mar. 2, 1867.....	50,000.00
July 11, 1870.....	50,000.00
Mar. 3, 1871.....	75,000.00
June 10, 1872.....	42,500.00
Feb. 21, 1873.....	50,000.00
Apr. 3, 1874.....	20,000.00
Feb. 10, 1875.....	25,000.00
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	1,697,500.00

California—Continued.**Fort at Fort Point—**

1854-65.....	\$2, 012, 500. 00
June 12, 1866.....	125, 000. 00
Mar. 2, 1867.....	25, 000. 00
July 11, 1870.....	100, 000. 00
Mar. 3, 1871.....	50, 000. 00
June 10, 1872.....	85, 000. 00
Feb. 21, 1873.....	65, 000. 00
Apr. 3, 1874.....	30, 000. 00
Feb. 10, 1875.....	25, 000. 00

 \$2, 517, 500. 00
Fort at Lime Point—

June 12, 1866.....	75, 000. 00
Mar. 2, 1867.....	25, 000. 00
July 11, 1870.....	100, 000. 00
Mar. 3, 1871.....	100, 000. 00
June 10, 1872.....	75, 000. 00
Feb. 21, 1873.....	75, 000. 00
Apr. 3, 1874.....	30, 000. 00
Jan. 10, 1875.....	20, 000. 00

 500, 000. 00
Fort at San Diego—

Feb. 21, 1873.....	50, 000. 00
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Yerba Buena Island—

Feb. 24, 1891.....	16, 000. 00
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 Total 6, 090, 000. 00

Connecticut:**Fort Griswold—**

1841-42.....	15, 000. 00
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Fort Hale—

1865.....	50, 000. 00
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Fort Trumbull—

1833-50.....	250, 400. 00
Apr. 3, 1874.....	25, 000. 00
Feb. 10, 1875.....	20, 000. 00

 295, 400. 00

 Total 360, 400. 00

Delaware:**Fort Delaware—**

1821-63.....	2, 041, 208. 98
July 11, 1870.....	37, 000. 00
Apr. 3, 1874.....	25, 000. 00

 2, 103, 208. 98
Fort opposite Fort Delaware—

1862.....	200, 000. 00
Mar. 3, 1871.....	50, 000. 00
June 10, 1872.....	42, 500. 00
Feb. 21, 1873.....	35, 000. 00
Apr. 3, 1874.....	30, 000. 00
Feb. 10, 1875.....	25, 000. 00

 382, 500. 00

 Total 2, 485, 708. 98

District of Columbia:**Washington, defenses of—**

1862-65.....	\$1, 250, 000. 00
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Florida:

Fort Barrancas—		
1838-57.....		\$523,500.00
Fort Clinch—		
1846-65.....	\$700,000.00	
June 12, 1866.....	50,000.00	
Mar. 2, 1867.....	12,500.00	
		762,500.00
Fort Jefferson—		
1844-65.....	2,725,000.00	
June 12, 1866.....	50,000.00	
Mar. 2, 1867.....	25,000.00	
Mar. 3, 1871.....	42,500.00	
June 10, 1872.....	42,500.00	
Feb. 21, 1873.....	50,000.00	
		2,935,000.00
Fort Marion—		
1833-49.....	139,766.96	
July 5, 1884.....	5,000.00	
Aug. 18, 1890.....	15,000.00	
		159,766.96
Fort McRea—		
1833-60.....		447,000.00
Fort Pickens—		
1828-57.....	766,223.31	
Feb. 10, 1875.....	25,000.00	
		791,223.31
Fort Taylor, Key West—		
1848-65.....	2,160,000.00	
June 12, 1866.....	100,000.00	
Mar. 2, 1867.....	25,000.00	
June 10, 1872.....	42,500.00	
Feb. 21, 1873.....	50,000.00	
Apr. 3, 1874.....	20,000.00	
Feb. 10, 1875.....	15,000.00	
		2,412,500.00
Total.....		8,031,490.27

Georgia:

Fort Jackson—		
1823-57.....	270,000.00	
June 10, 1872.....	15,000.00	
		285,000.00
Fort Pulaski—		
1830-57.....	882,308.56	
Mar. 3, 1871.....	26,500.00	
June 10, 1872.....	25,000.00	
Feb. 21, 1873.....	50,000.00	
Apr. 3, 1874.....	20,000.00	
Feb. 10, 1875.....	25,000.00	
		1,028,808.56
Total.....		1,313,808.56

Indian Territory:

Fort Towson—		
1842-44.....		16,000.00

Louisiana:

Bayou Bienvenue, battery at—		
1826-50.....		113,951.80
Fort Jackson—		
1822-63.....	795,692.00	
Mar. 3, 1871.....	50,000.00	
June 10, 1872.....	64,000.00	
Feb. 21, 1873.....	65,000.00	
Apr. 3, 1874.....	30,000.00	
Feb. 10, 1875.....	25,000.00	
		1,129,692.00

Louisiana—Continued.

Fort Livingston—		
1833-57.....		\$385,000.00
Fort Macomb—		
1831-57.....		52,180.00
Fort Pike, the Rigolets—		
1821-54.....		660,192.00
Fort at Proctors Landing, Lake Borgne—		
1855-57.....		150,000.00
Fort St. Philip—		
1840-63.....	\$363,300.00	
Mar. 3, 1871.....	37,500.00	
June 10, 1872.....	42,500.00	
Feb. 21, 1873.....	50,000.00	
Apr. 3, 1874.....	30,000.00	
Feb. 10, 1875.....	25,000.00	
		548,300.00
Tower Dupre—		
1829-57.....		35,077.41
Total.....		<u>3,074,393.21</u>

Maine:

Battery on Portland Head—		
June 10, 1872.....	50,000.00	
Feb. 10, 1875.....	20,000.00	
		70,000.00
Fort Gorges:		
1857-65.....	730,000.00	
June 12, 1866.....	50,000.00	
Mar. 2, 1867.....	25,000.00	
Mar. 3, 1871.....	15,000.00	
June 10, 1872.....	20,000.00	
		840,000.00
Fort Knox:		
1841-65.....		930,000.00
Fort McClary:		
1840-65.....	214,250.00	
Mar. 2, 1867.....	25,000.00	
		239,250.00
Fort Popham:		
1857-65.....	375,000.00	
June 12, 1866.....	50,000.00	
		425,000.00
Fort Preble:		
1833-65.....	412,970.00	
Mar. 2, 1867.....	25,000.00	
Mar. 3, 1871.....	28,500.00	
June 10, 1872.....	42,500.00	
Feb. 21, 1873.....	40,000.00	
Apr. 3, 1874.....	20,000.00	
Feb. 10, 1875.....	10,000.00	
		578,970.00
Fort Scammel:		
1840-65.....	428,400.00	
June 12, 1866.....	35,000.00	
Mar. 2, 1867.....	25,000.00	
Mar. 3, 1871.....	50,000.00	
June 10, 1872.....	42,500.00	
Feb. 21, 1873.....	50,000.00	
Apr. 3, 1874.....	30,000.00	
Feb. 10, 1875.....	20,000.00	
		680,900.00
Total.....		<u>3,764,120.00</u>

Maryland:

Fort Carroll—		
1848-64.....		\$1,375,000.00
Fort Foote—		
June 10, 1872	\$21,000.00	
Feb. 21, 1873	25,000.00	
		46,000.00
Fort at Lazaretto Point—		
June 10, 1872		13,000.00
Fort Madison—		
1841-57.....		55,000.00
Fort McHenry—		
1829-38.....	84,005.40	
June 10, 1872	21,000.00	
Feb. 21, 1873	25,000.00	
Feb. 10, 1875	20,000.00	
		150,005.40
Fort Washington—		
1821-65.....	238,000.00	
June 12, 1866	20,000.00	
Mar. 2, 1867	12,500.00	
June 10, 1872	21,000.00	
Feb. 21, 1873	25,000.00	
		316,500.00
Total.....		1,955,505.40

Massachusetts:

Battery on Long Island Head, Boston Harbor—		
Mar. 28, 1867.....	5,000.00	
Mar. 3, 1871.....	37,500.00	
Apr. 3, 1874.....	40,000.00	
Feb. 10, 1875.....	30,000.00	
		112,500.00
Fort at Clark's Point, New Bedford Harbor—		
1857-65.....	650,000.00	
June 12, 1866	30,000.00	
Mar. 2, 1867	15,000.00	
		695,000.00
Fort Independence—		
1832-1865.....	531,094.00	
Mar. 2, 1867.....	25,000.00	
Mar. 3, 1871.....	27,500.00	
July 11, 1871.....	53,000.00	
June 10, 1872.....	42,500.00	
Feb. 21, 1873.....	35,000.00	
		714,094.00
Fort Warren—		
1833-65.....	1,323,000.00	
June 12, 1866	25,000.00	
Mar. 2, 1867	25,000.00	
July 11, 1870.....	100,000.00	
Mar. 3, 1871.....	50,000.00	
June 10, 1872.....	85,000.00	
Feb. 21, 1873.....	40,000.00	
Feb. 10, 1875.....	25,000.00	
		1,673,000.00
Fort Winthrop—		
1841-65.....	385,000.72	
June 12, 1866	30,000.00	
Mar. 2, 1867	25,000.00	
July 11, 1870.....	69,000.00	
Mar. 3, 1871.....	45,500.00	
June 10, 1872.....	64,000.00	
Feb. 21, 1873	50,000.00	
		668,500.72

Massachusetts—Continued.

Boston Harbor—	
Aug. 18, 1890.....	\$235, 000. 00
Total.....	4, 098, 094. 72

Michigan:

Fort at Green Bay—	
1834.....	10, 000. 00
Fort Wayne—	
1841-65.....	\$275, 000. 00
June 12, 1866.....	50, 000. 00
	325, 000. 00
Total.....	335, 000. 00

Mississippi:

Fort at Ship Island—	
1857-65.....	545, 000. 00
June 12, 1866.....	10, 000. 00
Total.....	555, 000. 00

New Hampshire:

Battery in Portsmouth Harbor—	
1862-65.....	550, 000. 00
Feb. 21, 1873.....	50, 000. 00
Apr. 3, 1874.....	30, 000. 00
Feb. 10, 1875.....	20, 000. 00
	650, 000. 00
Fort Constitution—	
1826-65.....	336, 771. 00
June 12, 1866.....	75, 000. 00
	411, 771. 00
Total.....	1, 061, 771. 00

New Jersey:

Battery at Finns Point—	
July 11, 1870.....	33, 500. 00
Mar. 3, 1871.....	20, 000. 00
Feb. 21, 1873.....	40, 000. 00
Apr. 3, 1874.....	30, 000. 00
Feb. 10, 1875.....	25, 000. 00
	148, 500. 00
Fort at Sandy Hook—	
1857-65.....	1, 050, 000. 00
June 12, 1866.....	50, 000. 00
Mar. 2, 1867.....	25, 000. 00
Aug. 1, 1894.....	7, 500. 00
Mar. 3, 1897.....	75, 000. 00
	1, 207, 500. 00
Total.....	1, 356, 000. 00

New York:

Battery Hudson—	
1850-64.....	385, 000. 00
July 11, 1870.....	30, 000. 00
Mar. 3, 1871.....	16, 500. 00
June 10, 1872.....	17, 000. 00
Feb. 21, 1873.....	29, 000. 00
Apr. 3, 1874.....	13, 000. 00
Feb. 10, 1875.....	15, 000. 00
	505, 500. 00

New York—Continued.

Battery at Willets Point—

1857-65.....	\$950,000.00	
June 12, 1866.....	50,000.00	
Mar. 2, 1867.....	25,000.00	
July 11, 1870.....	90,000.00	
Mar. 3, 1871.....	45,000.00	
June 10, 1872.....	76,500.00	
Feb. 21, 1873.....	40,000.00	
Apr. 3, 1874.....	30,000.00	
Feb. 10, 1875.....	25,000.00	

\$1,331,500.00

Fort Columbus and Castle William—

1831-1864.....	416,897.00	
July 11, 1870.....	52,000.00	

468,897.00

Fort Hamilton—

1824-1865.....	988,000.00	
June 12, 1866.....	30,000.00	
July 11, 1870.....	46,000.00	
Mar. 3, 1871.....	25,000.00	
June 10, 1872.....	40,000.00	
Feb. 21, 1873.....	40,000.00	
Apr. 3, 1874.....	26,000.00	
Feb. 10, 1875.....	10,000.00	

1,205,000.00

Fort Lafayette—

1829-1857.....		66,113.16
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Fort Montgomery—

1841-1865.....	750,000.00	
June 12, 1866.....	50,000.00	
Mar. 2, 1867.....	12,500.00	

812,500.00

Fort Niagara—

1838-1865.....		124,500.00
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Fort Ontario—

1839-1865.....	145,500.00	
June 12, 1866.....	50,000.00	

195,500.00

Fort Porter—

1841-65.....		180,000.00
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Fort Schuyler—

1828-65.....	1,052,000.00	
June 12, 1866.....	30,000.00	
Mar. 2, 1867.....	25,000.00	
July 11, 1870.....	80,000.00	
Mar. 3, 1871.....	57,500.00	
June 10, 1872.....	85,000.00	
Feb. 21, 1873.....	65,000.00	
Apr. 3, 1874.....	25,000.00	
Feb. 10, 1875.....	25,000.00	

1,444,500.00

Fort Tompkins—

1857-65.....	942,300.00	
June 12, 1866.....	50,000.00	
Mar. 2, 1867.....	25,000.00	
Mar. 3, 1871.....	52,000.00	
June 10, 1872.....	83,000.00	
Feb. 21, 1873.....	30,000.00	
Apr. 3, 1874.....	30,000.00	
Feb. 10, 1875.....	20,000.00	

1,470,300.41

Fort Wadsworth (formerly Fort Richmond)—

1846-64.....	738,646.56	
Feb. 10, 1875.....	5,000.00	

743,646.56

^a Transferred.

New York—Continued.

Fort Wood, Bedloe's Island—		
1841-57.....	\$218,000.00	
July 11, 1870.....	16,000.00	
June 10, 1872.....	17,000.00	
		\$251,000.00
New York—		
Aug. 18, 1890 (gun and mortar batteries).....		726,000.00
Governors Island—		
Aug. 18, 1890.....		50,000.00
Total.....		9,574,957.13

North Carolina:

Fort Caswell—		
1825-57.....	544,264.59	
May 25, 1900.....	150,000.00	
		694,264.59
Fort Macon, Beaufort—		
1825-61.....		466,500.00
Total.....		1,160,764.59

Pennsylvania:

Fort Mifflin—		
1841-65.....	75,900.00	
June 12, 1866.....	25,000.00	
July 11, 1870.....	55,000.00	
Mar. 3, 1871.....	26,000.00	
June 10, 1872.....	72,000.00	
Feb. 10, 1875.....	25,000.00	
Total.....		278,900.00

Rhode Island:

Battery on Dutch Island—		
1862-63.....	350,000.00	
Feb. 21, 1873.....	40,000.00	
Apr. 3, 1874.....	20,000.00	
Feb. 10, 1875.....	20,000.00	
		430,000.00
Fort Adams, Bretons Point—		
1824-65.....	1,838,316.67	
June 10, 1872.....	85,000.00	
Feb. 21, 1873.....	65,000.00	
Apr. 3, 1874.....	20,000.00	
Feb. 10, 1875.....	15,000.00	
		2,023,316.67
Fort Wolcott—		
1827-36.....		1,000.00
Total.....		2,454,316.67

South Carolina:

Castle Pinckney—		
1841-56.....		12,000.00
Fort Johnson—		
1841-54.....		38,700.00
Fort Moultrie—		
1828-60.....	942,144.91	
Mar. 3, 1871.....	25,000.00	
June 10, 1872.....	35,000.00	
Feb. 21, 1873.....	40,000.00	
Apr. 3, 1874.....	20,000.00	
Feb. 10, 1875.....	15,000.00	
		1,077,144.91

South Carolina—Continued.

Fort Sumter—		
1840-59.....	\$823,000.00	
Mar. 3, 1871.....	25,000.00	
June 10, 1872.....	35,000.00	
Feb. 21, 1873.....	40,000.00	
Apr. 3, 1874.....	20,000.00	
		\$943,000.00
Total.....		2,070,844.91

Texas:

Defenses of Galveston Harbor—		
1857-60.....		100,000.00
Fort Brown—		
1854-55.....	150,000.00	
Mar. 3, 1875.....	25,000.00	
		175,000.00
Fort Duncan—		
1875.....		10,000.00
Total.....		285,000.00

Virginia:

Fort Monroe—		
1821-65.....	2,224,113.10	
June 12, 1866.....	30,000.00	
Mar. 2, 1867.....	25,000.00	
June 10, 1872.....	42,500.00	
Feb. 21, 1873.....	40,000.00	
Apr. 3, 1874.....	30,000.00	
Feb. 10, 1875.....	20,000.00	
Feb. 24, 1891.....	27,000.00	
Artesian wells.....	6,000.00	
Aug. 1, 1894.....	37,500.00	
Aug. 4, 1886.....	100,000.00	
Aug. 10, 1888.....	75,000.00	
1890.....	20,000.00	
		2,677,113.10
Fort Wool (formerly Calhoun), ripraps—		
1821-64.....		2,355,000.00
Total.....		5,032,113.10

Miscellaneous:

Batteries, gun and mortar—		
Feb. 24, 1891.....	a 750,000.00	
July 23, 1892.....	b 500,000.00	
Feb. 18, 1893.....	c 50,000.00	
Aug. 1, 1894.....	400,000.00	
	d 100,000.00	
Mar. 2, 1895.....	400,000.00	
	d 100,000.00	
June 6, 1896.....	2,400,000.00	
	e 100,000.00	
Mar. 3, 1897.....	1,341,333.00	
	2,500,000.00	
May 7, 1898.....	3,000,000.00	
July 7, 1898.....	2,562,000.00	
Mar. 3, 1899.....	1,000,000.00	
May 25, 1900.....	2,000,000.00	
		17,203,333.00

a Boston and New York harbors.
b San Francisco Harbor and Hampton Roads.
c Washington.

d Constructing platforms.
e Constructing necessary buildings.

Miscellaneous—Continued.

Batteries, pneumatic—		
July 7, 1898.....	^a \$150,000.00	
May 25, 1900.....	180,000.00	
		\$330,000.00
Board, Endicott—		
Mar. 3, 1885.....		40,000.00
Columbia River, defenses at mouth of, Oreg. and Wash. T.—		
1862-64.....		400,000.00
Contingencies of fortifications—		
1821-65.....	5,711,677.17	
July 11, 1870.....	150,000.00	
Mar. 3, 1871.....	250,000.00	
June 10, 1872.....	250,000.00	
Feb. 21, 1873.....	100,000.00	
Apr. 3, 1874.....	75,000.00	
Feb. 10, 1875.....	75,000.00	
Mar. 3, 1883.....	158.00	
July 7, 1884.....	93.87	
Aug. 4, 1886.....	2,339.42	
	71.17	
Sept. 30, 1890.....	2,682.39	
	^b 74,768.48	
	13.90	
Mar. 3, 1891.....	28.00	
July 28, 1892.....	352.17	
Mar. 3, 1893.....	77.02	
July 7, 1898.....	2.22	
June 6, 1900.....	54.79	
		6,692,318.60
Fortifications—		
1813-36.....		4,860,723.10
Fortifications of ports and harbors—		
1794-1812.....		4,551,046.30
Fortifications, plans of—		
Aug. 18, 1890.....	5,000.00	
Feb. 24, 1891.....	5,000.00	
July 23, 1892.....	5,000.00	
Feb. 18, 1893.....	5,000.00	
Aug. 1, 1894.....	5,000.00	
Mar. 2, 1895.....	5,000.00	
June 6, 1896.....	5,000.00	
Mar. 3, 1897.....	5,000.00	
May 7, 1898.....	5,000.00	
Mar. 3, 1899.....	5,000.00	
May 25, 1900.....	5,000.00	
		55,000.00
Fortifications on the northern frontier—		
1862.....		750,000.00
National defense—		
Mar. 9, 1899.....		^c 3,817,879.62
Plant, electric light and power—		
May 25, 1900.....		25,000.00
Preservation and repair of fortifications—		
1841-61.....	67,000.00	
June 8, 1868.....	200,000.00	
Mar. 3, 1869.....	200,000.00	
July 11, 1870.....	75,000.00	
June 20, 1876.....	100,000.00	
Mar. 3, 1877.....	100,000.00	
Mar. 3, 1878.....	100,000.00	
Mar. 3, 1879.....	100,000.00	
May 4, 1880.....	100,000.00	
Mar. 3, 1881.....	175,000.00	

^a San Francisco Harbor.^b Credited in accounts of Maj. J. C. Fremont.^c Allotted from \$50,000,000 for national defense.

Miscellaneous—Continued.

Preservation and repair of fortifications—Continued.

May 19, 1882.....	\$175,000.00	
Mar. 3, 1883.....	175,000.00	
July 5, 1884.....	175,000.00	
Mar. 3, 1885.....	100,210.00	
Sept. 22, 1888.....	100,000.00	
Mar. 2, 1889.....	100,000.00	
Aug. 18, 1890.....	80,000.00	
Feb. 24, 1891.....	80,000.00	
July 23, 1892.....	60,000.00	
Feb. 18, 1893.....	45,000.00	
Aug. 1, 1894.....	45,000.00	
Mar. 2, 1895.....	45,000.00	
June 6, 1896.....	50,000.00	
Mar. 2, 1897.....	100,000.00	
May 7, 1898.....	100,000.00	
Mar. 3, 1899.....	100,000.00	
May 25, 1900.....	100,000.00	
		\$2,847,210.00

Range and position finders—

July 7, 1898.....	150,000.00	
May 25, 1900.....	150,000.00	
		300,000.00

Seacoast mortar batteries—

July 11, 1870.....	75,000.00	
Mar. 3, 1871.....	100,000.00	
June 2, 1872.....	100,000.00	
June 14, 1878.....	301.50	
		275,301.50

Sea walls and embankments—

Sept. 22, 1888.....	117,000.00	
June 6, 1896.....	17,975.00	
Mar. 3, 1897.....	33,000.00	
May 7, 1898.....	55,000.00	
Mar. 3, 1899.....	2,500.00	
May 25, 1900.....	50,000.00	
		275,475.00

Sites for seacoast defenses—

June 12, 1866.....	35,000.00	
Mar. 2, 1867.....	37,500.00	
Mar. 3, 1871.....	150,000.00	
Aug. 18, 1890.....	500,000.00	
Feb. 24, 1891.....	500,000.00	
July 27, 1892.....	500,000.00	
Feb. 18, 1893.....	175,000.00	
Aug. 1, 1894.....	150,000.00	
June 6, 1896.....	500,000.00	
Mar. 3, 1897.....	500,000.00	
May 7, 1898.....	300,000.00	
Mar. 3, 1899.....	300,000.00	
May 25, 1900.....	200,000.00	
		3,847,500.00

Surveys—

Aug. 4, 1886.....		12.00
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Torpedoes:

May 19, 1882—		
Torpedoes, preservation of torpedoes, experiments, and instruction of troops...	100,000	
Mar. 3, 1883—		
One-half for latest improved torpedoes...	75,000	
July 5, 1884—		
Purchase, if recommended, of submarine movable torpedoes.....	50,000	
Improving and testing motors for movable torpedoes.....	25,000	

Miscellaneous—Continued.**Torpedoes—Continued.****July 5, 1884—Continued.**

Submarine mines.....	\$5,000
Torpedo experiments and instruction of troops.....	20,000

Mar. 3, 1885—

Submarine movable torpedoes.....	50,000
Motors for torpedoes.....	25,000
Appliances for submarine mines.....	19,000
Experiments and instructions.....	20,000

Sept. 22, 1888—

Torpedoes.....	200,000
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Mar. 2, 1889—

Torpedoes.....	250,000
Casemates and cable galleries.....	250,000
Experiments and instructions.....	30,000
Movable submarine torpedoes.....	50,000

Aug. 18, 1890—

Torpedoes.....	100,000
Casemates and cable galleries.....	100,000
Experiments, instruction.....	30,000

Feb. 24, 1891—

Mines and appliances.....	50,000
Casemates and cable galleries.....	50,000

Mar. 2, 1895—

Mines and appliances.....	20,000
Casemates, cable galleries, etc.....	20,000

June 6, 1896—

Mines, appliances, etc.....	100,000
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Mar. 3, 1897—

Mines, appliances, etc.....	150,000
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May 4, 1898—

Mines, appliances, etc.....	50,000
Planting mines.....	300,000

May 7, 1898—

Mines, appliances, etc.....	150,000
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June 8, 1898—

Manila Harbor.....	150,000
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July 7, 1898—

Care and maintenance of mine fields.....	738,000
Searchlights and other materials.....	650,000

Mar. 3, 1899—

Mines, appliances, etc.....	50,000
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May 25, 1900—

Mines, appliances, etc.....	50,000
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\$3,925,000

50,195,799.12

Grand total.....

108,748,894.24

INDEX OF BRIDGES.

NOTE.—The bridges are indexed under the name of the stream or harbor which they cross.

The letter in parentheses after each title refers to the following:

- A.—Alterations.
- O.—Obstructing navigation; alterations required in a specified time.
- S.—State laws, to be erected or altered under.
- Sp.—Special acts of Congress, erected under.

ACUSHNET RIVER, BETWEEN NEW BEDFORD AND FAIRHAVEN, MASS. (S.)

(Bristol County bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 96, 426; 97, 531.

Plans.

Reconstruction plans partly (from Fairhaven to Popes Island) approved June

23, 1896, pending results of survey provided for in river and harbor act June 3, 1896, 96, 426. Modified plans approved Sept. 23, 1896; construction plans (second part between Popes and Fish islands) approved July 17, 1897, 97, 532.

ACUSHNET RIVER, BETWEEN POPES AND FISH ISLANDS, NEW BEDFORD HARBOR, MASS. (S.)

(Union Street Rwy. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 535.

Plans.

Plans for a temporary bridge during

reconstruction of county bridge between Popes and Fish islands, approved (revocable permit) Aug. 20, 1897, 97, 535.

AHNAPEE RIVER, ALGOMA, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.

Approved Apr. 11, 1899, 99, 622.

ALABAMA RIVER, NEAR MONTGOMERY, ALA. (Sp.)

(Mobile & Ohio R. R. Co., successors to the Montgomery, Tuscaloosa & Memphis Rwy. Co., formerly the Alabama Great Northwestern Rwy. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 90, 336; 97, 530.

Legislation.

Original company authorized to construct bridge by act of Aug. 6, 1888, 90, 336. By act of June 11, 1896, this fran-

chise was granted to the Mobile & Ohio R. R. Co., 97, 530.

Plans.

Original company's plans approved Aug. 5, 1889, 90, 336. Plans, June 10, 1897, for a different location, approved June 16, 1897, 97, 530.

ALABAMA RIVER, NEAR MONTGOMERY, ALA. (Sp.)

(Montgomery Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **94**, 425.
 ENGINEER IN CHARGE. Maj. F. A. Mahan.

Legislation.

Company authorized to construct bridge by act of Mar. 1, 1893, **94**, 425.

Plans.

Plans submitted Feb. 8, 1894; modified Feb. 23, 1894; approved Mar. 27, 1894, **94**, 425.

ALABAMA RIVER, SELMA, ALA. (A.)**Engineers.**

CHIEF OF ENGINEERS. Reports, **86**, 370, 2136.

BOARD OF ENGINEERS. Bridge considered an obstruction to navigation; recommended that the bridge company be required to prepare a channel between pivot span and north bank for the passage of boats at all stages exceeding a 24-f.

stage, and to provide such future facilities to navigation as might be required, **86**, 2136.

Plans.

It having been represented that the bridge was likely to create an obstruction to navigation, a Board of Engineers was convened in 1886 to consider and report upon the question, **86**, 370, 2136.

ALEQUA CREEK, NEAR PORTLAND, FLA. (S.)

(Walton County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **97**, 534.

Plans.

Approved Aug. 11, 1897, **97**, 534.

ALGER (OR BROOKS) SLOUGH, WAHKIAKUM COUNTY, WASH. (Sp., etc.)

(County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **92**, 404.

ENGINEER IN CHARGE. Capt. T. W. Symons.

Legislation.

County authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Washington, **92**, 404.

Plans.

Approved Mar. 19, 1892. Completion of bridge reported on June 25, 1892. **92**, 404.

ALHAMBRA SLOUGH. (See Pacheco Slough.)**ALLEGHENY RIVER. (See Ohio River, etc.)****ALLEGHENY RIVER, CREIGHTON, PA. (S.)**

(Creighton Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **94**, 428.

ENGINEER IN CHARGE. Capt. R. L. Hoxie.

Plans.

Approved Feb. 27, 1894, **94**, 428.

ALLEGHENY RIVER, FREEPORT, PA. (S.)

(Armstrong and Westmoreland counties' bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **96**, 426.

Plans.

Approved May 6, 1896.

ALLEGHENY RIVER, NEAR MOSGROVE, PA. (S.)

(Allegheny & Western Rwy. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Modified plans approved Feb. 23, 1898.

Modified plans reducing the length of spans and changing construction of piers approved May 24, 1898. 98, 535.

ALLEGHENY RIVER, NEW KENSINGTON, PA. (S.)

(New Kensington Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Modified plans approved April 8, 1898, 98, 535.

ALLEGHENY RIVER, NEW KENSINGTON, PA. (S.)

(Tarentum Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 470.
ENGINEER IN CHARGE. Lt. Col. A. Stickney.

Plans.

Approved June 10, 1893, 93, 470.

ALLEGHENY RIVER, OIL CITY, PA. (Sp., etc.)

(Relief Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 410.
ENGINEER IN CHARGE. Maj. A. Stickney.

under act of July 13, 1892, sec. 3, and act of Pennsylvania, 92, 410.

Plans.

Approved Sept. 1, 1892, 92, 410.

Legislation.

Company authorized to construct bridge

ALLEGHENY RIVER AT PITTSBURG, PA. (S.)

Engineers.

CHIEF OF ENGINEERS. Report, 75, ii, 121. Approves report of Maj. Merrill, 75, ii, 684.

Plans.

Maj. Merrill reported bridge a serious and unnecessary obstruction to navigation, 75, ii, 687, 688. Drawspan recommended, 75, ii, 687, 688. Plan, 75, ii, 686.

Legislation.

Bridge authorized by Pennsylvania, 75, ii, 685.

ALLEGHENY RIVER, NEAR PITTSBURG, PA. (Sp.)

(Butler & Pittsburg R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 424.

Plans.

Approved Aug. 18, 1896, 96, 424.

Legislation.

Authorized by act of June 11, 1896, 96, 424.

ALLEGHENY RIVER, HIGHLAND PARK, FROM A POINT AT OR NEAR PITTSBURG, PA., TO SHARPSBURG, PA. (S.)

(Highland Park Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 699.

Plans.

Approved Sept. 13, 1899, 1900, 699.

ALLEGHENY RIVER, PITTSBURG (SIXTH STREET), PA.
(Sp.)

(Allegheny Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 91, 431; 92, 408.

ENGINEER IN CHARGE. Lt. Col. W. E. Merrill.

Legislation.

Authorized under act of Sept. 19, 1890,

sec. 7, and act of Pennsylvania, 91, 431.

Plans.

Approved May 2, 1891, 91, 431. Plans for false work, erected during progress of work, approved Aug. 4, 1892, 92, 408.

ALLEGHENY RIVER, PITTSBURG TO SHARPSBURG, PA. (S.)

(Pittsburg & Sharpsburg Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 537.

Plans.

Approved Aug. 24, 1898, 98, 537.

ALLEGHENY RIVER, BELOW TARENTUM, PA. (S.)

(Kensington Rapid Transit Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 428.

ENGINEER IN CHARGE. Capt. R. L. Hoxie.

Plans.

Submitted Mar. 28, 1894; modified Apr. 14, 1894; approved Apr. 28, 1894, 94, 428.

ALTAMAHA RIVER, DOCTOR TOWN, GA. (A.) (See *Ashley River; Ogeechee River.*)

(Savannah, Florida & Western R. R. Co.)

Engineers.

ENGINEER IN CHARGE. Col. Q. A. Gilmore. Report, 88, 2549.

Plans.

Bridge without a draw; an obstruction, 88, 2550.

ANACOSTIA RIVER (Eastern Branch of Potomac River).

(Benning's Bridge, upper.)

Engineers.**ENGINEERS IN CHARGE:**

Maj. N. Michler, 1867-70. Reports, 67, 521; 68, 890; 69, 493; 70, 518.

Maj. O. E. Babcock, 1871-77. Reports, 71, 969; 72, 1015; (Col.), 74, ii, 394; 75, ii, 810; 76, ii, 890; 77, ii, 1066.

Lt. Col. T. L. Casey, 1879-80. Reports, 79, 1882; 80, 2342.

Col. A. F. Rockwell, 1881-84. Reports, 81, 2715; 82, 2738; 83, 2101; 84, 2346.

Lt. Col. J. M. Wilson, 1885-86. Reports, 85, 2509; 86, 2084.

Lt. Col. C. J. Allen, 1899. Report, 99, 1447.

Operations.

1867. Recently rebuilt, 67, 521.

1868-72. Minor repairs made, 68, 890; 70, 518; 71, 969; 72, 1015.

1874-77. Repairs made, 74, ii, 394; 76, ii, 890; 77, ii, 1066.

1878-79. Thoroughly repaired, 79, 1882.

1880-82. Extensive repairs made, 80, 2342; 81, 2715; 82, 2738.

1883-86. Roadway repaired, 83, 2101; 84, 2346; 85, 2509; 86, 2084.

Projects.

Bridge forms an important connection between D. C. and Md., 70, 518.

Lt. Col. Wilson estimated, 1886, it would cost \$10,000 to improve the bridge, 86, 2084.

ANACOSTIA RIVER (Eastern Branch of Potomac River).

(New Navy-Yard Bridge.)

Appropriations.

1874. \$146,000, **75**, ii, 806.

Contracts.

1874. Clark, Reeves & Co., bridge (within limit of appropriation, \$146,000), **75**, ii, 817.

Engineers.

CHIEF OF ENGINEERS. Reports, **75**, 126; **76**, ii, 688.

ENGINEERS IN CHARGE:

Col. O. E. Babcock, 1875-77. Reports, **75**, ii, 806; **76**, ii, 687; **77**, ii, 1066, 1070.

Lt. Col. T. L. Casey, 1879-80. Reports, **79**, 1883; **80**, 2342.

Col. A. F. Rockwell, 1881-84. Reports, **81**, 2715; **82**, 2738; **83**, 2101; **84**, 2346.

Col. J. M. Wilson, 1885-86. Reports, **85**, 2509; **86**, 2084.

Lt. Col. C. J. Allen, 1899. Report, **99**, 1447.

Legislation.

Construction authorized by act of June 22, 1874; **75**, ii, 806.

One of the railroad tracks removed according to act of March 3, 1879; **79**, 1882.

Operations.

1874-75. Bridge completed and opened to the public June 17, 1875; **75**, ii, 806.

1876-77. Some repairs made, **77**, ii, 1066.

1879-80. Roadway and foot walks repaired, **80**, 2342.

1880-81. Extensive repairs made, **81**, 2715.

1881-82. Sidewalks, roadway, and brick pavements repaired, **82**, 2738.

1882-86. Roadway repaired, **83**, 2101; **84**, 2346; **85**, 2509; **86**, 2084.

Private (corporate) work.

Permission to lay rails across the Anacostia Bridge was granted Mar. 14, 1876, to the Anacostia & Potomac River R. R. Co., by the Secretary of War, under certain restrictions and regulations, **76**, ii, 688.

Company removed east track, **79**, 1882.

Projects.

Lt. Col. Wilson estimated, 1886, it would cost \$5,500 to improve the bridge, **86**, 2084.

Surveys.

Survey made, 1875. **75**, ii, 806.

Report made, 1875, by Col. Babcock on the application of the Anacostia & Potomac River R. R. Co. for permission to lay rails across the Anacostia Bridge (see *Private work*), **76**, ii, 687.

ANACOSTIA RIVER (Eastern Branch of Potomac River).

(Old Navy-Yard Bridge, lower.)

Engineers.

ENGINEERS IN CHARGE:

Maj. N. Michler, 1867-71. Reports, **67**, 521; **68**, 891; **69**, 494; **70**, 518; **71**, 975.

Maj. O. E. Babcock, 1870-74. Reports, **70**, 969; **72**, 1015; (Col.), **74**, ii, 394.

Legislation.

Application made, 1868, to Congress to incorporate the Uniontown & Washington City R. R. with authority to lay tracks along certain streets and to cross this bridge, **68**, 891.

Operations.

1867. Bridge recently renovated, **67**, 521.

1867-68. Floor repaired, **68**, 891.

1869-70. Continual repairs being made, **70**, 518; **71**, 1015.

1873-74. Broken span repaired, **74**, ii, 394.

1874-76. Repairs made, **76**, ii, 690.

Projects.

Act of Congress authorized the bridge to be sold by auction, June 21, 1875. Bids too low; no sale. **75**, ii, 810.

Surveys.

Survey of the lower bridge, known as the Navy-Yard Bridge, across the Anacostia River, and plan for a permanent structure across same, capable of sustaining railroad track and cars, with estimate of cost, ordered by a resolution of the Senate June 20, 1868, made, 1868, by Maj. Michler, **68**, 891; **69**, 494.

ANACOSTIA RIVER (Eastern Branch of Potomac River).

(Washington, D. C.)

Engineers.CHIEF OF ENGINEERS. Report, **96**, 430.ENGINEER IN CHARGE. Maj. C. E. L. B. Davis, 1896. Report, **96**, 3889.**Physical characteristics.**Borings for site of bridge, **96**, 3892, 3901.Comparison of routes, **96**, 3895.**Projects.**Description of proposed bridge, **96**, 3895.

Maj. Davis estimated, 1896, it would

cost \$779,130 to construct a bridge at the foot of First street SW., **96**, 3899.**Surveys.**Survey, plan, and estimate of cost of construction of a substantial and suitable bridge, with necessary approaches, from foot of South Capitol street, or below it at the most available point, across the Eastern Branch of the Potomac River, and report thereon, ordered by act of Mar. 2, 1895, made, 1896, by Maj. Davis (report unfavorable to site) (see *Projects*), **96**, 3890.**ANACOSTIA RIVER, D. C.**

(Baltimore & Potomac R. R.)

Engineers.ENGINEER IN CHARGE. Lt. Col. C. J. Allen, 1899. Report, **99**, 1447.**Projects.**Description of bridge, **99**, 1447.**ANACOSTIA RIVER, D. C.**

(Pennsylvania avenue bridge—highway.)

Engineers.ENGINEER IN CHARGE. Lt. Col. C. J. Allen, 1899. Report, **99**, 1447.**Projects.**Description of bridge, **99**, 1447.**ANACOSTIA RIVER (in line with Massachusetts avenue extended).**

(Washington, D. C.)

Engineers.CHIEF OF ENGINEERS. Report, **98**, 541.ENGINEER IN CHARGE. Lt. Col. C. J. Allen, 1898. Report, **98**, 3598.**Physical characteristics.**Borings on site, **98**, 3600.**Projects.**Col. Allen estimated, 1897, it would cost \$441,208 for a steel truss bridge, **98**, 3606.Description of proposed bridge, **98**, 3602-3606.**Surveys.**Survey, plan, and estimate of cost of a bridge across the Eastern Branch of the Potomac River (Anacostia River) in line with Massachusetts avenue extended eastward, ordered by act of Feb. 17, 1897, made, 1897, by Col. Allen. (See *Projects*), **98**, 3599.**AQUIA CREEK, VA. (S.)**

(Richmond, Fredericksburg & Potomac R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **95**, 479.

ENGINEER IN CHARGE. Maj. C. E. L. B. Davis.

Plans.Plans for new draw in bridge approved June 6, 1895, **95**, 479.

ARKANSAS RIVER. (See *Ouachita River* and *Petit Jean River*.)

ARKANSAS RIVER, CUMMINGS LANDING, ARK. (Sp.)

(Kansas City, Arkansas & New Orleans R. R. Co. at.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 337.

Legislation.

Authorized by act of July 24, 1888, 90, 337.

Plans.

Plan and location submitted and approved by Secretary of War, Feb. 25, 1890, 90, 337.

ARKANSAS RIVER, DARDANELLE, ARK. (Sp.)

(Cable City Bridge Construction Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 430.

ENGINEER IN CHARGE. Capt. H. S. Taber.

Legislation.

Company authorized to construct bridge by act of Sept. 30, 1890, 91, 430.

Authorized to erect an additional tower to operate draw, conditionally, May 16, 1891, 91, 430.

Plans.

Approved Dec. 23, 1890, 91, 430.

ARKANSAS RIVER, FORT SMITH, ARK. (Sp.)

(Kansas & Arkansas Valley R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 338.

Legislation.

Authorized by act of March 15, 1890, 90, 338.

Plans.

Plan and location submitted and approved by Secretary of War, May 17, 1890, 90, 338.

ARKANSAS RIVER, NEAR HICKS ROCK, INDIAN TERRITORY. (Sp.)

(Kansas City, Pittsburg & Gulf R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 476.

ENGINEER IN CHARGE. Lt. W. L. Sibert.

Legislation.

Company authorized to construct bridge by act of Feb. 27, 1893, 95, 476.

Plans.

Plans submitted June 21, 1895, modified July 22, 1895; approved July 29, 1895, 95, 476.

ARKANSAS RIVER, LITTLE ROCK, ARK. (Sp.)

Engineers.

CHIEF OF ENGINEERS. Reports, 81, 267; 84, 270, 1789.

Legislation.

Bridge authorized by acts of July 1, 1870, and May 31, 1872, 81, 2010; 84, 270, 1789.

Plans.

Submitted by Little Rock Bridge Co. in compliance with act of May 31, 1872,

approved by Chief of Engineers and Secretary of War Feb. 15, 1873, 73, 591, 592.

Requirements of Congress, 81, 2010.

Plan, bridge company, 81, 2013.

Board of surveyors convened at Little Rock. Bridge unequal to the requirements of commerce, 81, 2013.

Modifications recommended by Maj. Adams concurred in by the Chief of Engineers and approved by the Secretary of War, 84, 1790, 1791.

ARKANSAS RIVER, LITTLE ROCK, ARK. (Sp.)

(Choctaw & Memphis R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **99**, 618.**Legislation.**Company authorized to construct bridge by act of Jan. 10, 1899, **99**, 618.**Plans.**Approved Mar. 1, 1899, **99**, 618.**ARKANSAS RIVER, LITTLE ROCK, ARK. (Sp.)**

(Little Rock Bridge & Terminal Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **94**, 425.

ENGINEER IN CHARGE. Capt. C. F. Palfrey.

Legislation.

Company authorized to construct bridge

by act of Mar. 2, 1891; amendment by act of Feb. 11, 1893, **94**, 425.**Plans.**Approved Dec. 7, 1893, **94**, 425.**ARKANSAS RIVER, LITTLE ROCK, ARK. (Sp.)**

(Pulaski County bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **96**, 423.**Legislation.**

County authorized to construct bridge

by act of Feb. 28, 1893; amending act, May 13, 1896, **96**, 423.**Plans.**Approved June 12, 1896, **96**, 423.**ARKANSAS RIVER, VAN BUREN, ARK. (Sp.)****Engineers.**CHIEF OF ENGINEERS. Report, **84**, 270, 1792.**Legislation.**Bridge authorized by act of July 3, 1882, **84**, 270.**Plans.**

Plans as originally proposed modified by the recommendations of a board of

engineers. Railroad company objected to the changes. In 1884 the railroad company proposed to construct at its own expense any work which might subsequently be found necessary for the maintenance of navigation. The Chief of Engineers thereupon recommended the approval of original site, which was approved by the Secretary of War. **84**, 270, 1792, 1796.**ARKANSAS RIVER, NEAR VAN BUREN, ARK. (Sp.)**

(Fort Smith & Van Buren Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **95**, 475.**Legislation.**

Company authorized to construct

bridge by act of March 9, 1894, **95**, 475.**Plans.**Approved Mar. 8, 1895, **95**, 475.**ASHEPOO RIVER, S. C. (A.)**

(Charleston & Savannah R. R. bridge—new.)

Engineers.ENGINEER IN CHARGE. Capt. F. V. Abbot, 1889. Report, **89**, 2796.**Plans.**Company should be required to remove piles of old bridge if the United States ever does any work on this river, **89**, 2796.**ASHLEY RIVER, S. C. (O.)**

(New bridge Co.)

Engineers.CHIEF OF ENGINEERS. Report, **91**, 433.**Plans.**Required alterations to be, and were, completed by July 1, 1891, **91**, 433.

ASHLEY, EDISTO, SALKAHATCHIE, CHEEHAN, SAVANNAH, AND ALTAMAHA RIVERS, AND ST. AUGUSTINE CREEK, GA. AND S. C. (A.)

Engineers.

ENGINEER IN CHARGE. Col. Q. A. Gillmore. Report, 88, 2629, 2663.

Modifications suggested by Col. Gillmore in such of these structures as obstruct navigation, 88, 2663.

Plans.

Description of the bridges and of the modifications proposed therein, 88, 2630.

ASHTABULA RIVER, ASHTABULA, O. (S.)

(Lake Shore & Michigan Southern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 534.

Plans.

Reconstruction plans approved May 11, 1897, 97, 534.

ASHTABULA RIVER, O. (O.)

(Ashtabula County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 429.

Plans.

Specified alterations required on or before Apr. 1, 1898, 96, 429.

ATKINS BAY, KENNEBEC RIVER, PHIPPSBURG, ME.

(Sp., etc.)

(Sagadahoc County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 405.

ENGINEER IN CHARGE. Lt. Col. P. C. Hains.

under act of Sept. 19, 1890, sec. 7, and act of Maine, 92, 405.

Plans.

Submitted July 30, 1891. On May 2, 1892, no objections. 92, 405.

Legislation.

County authorized to construct bridge

BACK COVE (channel leading to), PORTLAND HARBOR, ME.

(O.)

(Grand Trunk Ry. Co. of Canada.)

Engineers.

CHIEF OF ENGINEERS. Reports, 90, 343; 91, 435.

Plans.

Specified alterations required on or before Jan. 1, 1892, 91, 435.

BALL CLUB RIVER, MINN. (S.)

(Eastern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Approved Apr. 7, 1898, 98, 535.

BARLOWS RIVER, BOURNE, MASS. (S.)

(Town bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Reconstruction plans approved May 24, 1898, 98, 535.

BARTHOLOMEW BAYOU, ARK. (Sp.)

(Mississippi River, Hamburg & Western Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 531.

Plans.

Approved May 17, 1898, 98, 531.

Legislation.

Company authorized to construct bridge by act of Mar. 12, 1898, 98, 531.

BASTROP BAYOU AND CHOCOLATE BAYOU, TEX. (Sp., etc.)
(Brazoria County bridges.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 409.
ENGINEER IN CHARGE. Maj. C. J. Allen.

under act of July 13, 1892, sec. 3, and act of Texas, 92, 409.

Plans.

Plans for these two bridges approved Aug. 24, 1892, 92, 409.

Legislation.

County authorized to construct bridges

BEACH THOROUGHFARE. (See Schuylkill River, etc.)

BELFAST BAY, ME. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 425.

Plans.

Approved Dec. 6, 1895, 96, 425.

BELLE RIVER, MARINE CITY, MICH. (S.)

(Rapid Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Approved July 3, 1899, 99, 623.

BELLE RIVER, MARINE CITY, MICH. (S.)

(Detroit & Northern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Approved July 26, 1899, 99, 623.

BEVERLY HARBOR, BETWEEN SALEM AND BEVERLY, MASS. (S.)

(Essex County bridge—Essex bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 532.

plans for a temporary bridge were approved Nov. 19, 1896, 97, 532.

Plans.

Reconstruction plans for the draw and

BIG BLACK RIVER, MISS. (A.)

Engineers.

ENGINEER IN CHARGE. Capt. E. Bergland. Report, 88, 2554.

bridges should be changed to draw-bridges. 88, 2554.

Plans.

Description of Louisville, New Orleans & Texas R. R. bridge. An obstruction at all stages of water. Center span should be made a pivot draw. The two county

Description of Vicksburg & Meridian R. R. bridge. Authorized by Mississippi, 1865. An obstruction at all stages. One of the piers should be replaced by a pivot pier and two of the spans by a pivot draw. 88, 2554.

BIG BLACK RIVER, BALDWIN FERRY (About 15 miles east of Vicksburg, Miss). (Sp., etc.)

(Warren County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 405.
ENGINEER IN CHARGE. Capt. J. H. Willard.

under act of Sept. 19, 1890, sec. 7, and act of Mississippi, 92, 405.

Plans.

Approved Apr. 28, 1892, 92, 405.

Legislation.

County authorized to construct bridge

BIG BLACK RIVER, HANKINSONS FERRY, MISS. (S.)

(Warren County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 430.
ENGINEER IN CHARGE. Capt. J. H. Willard.

Plans.

Approved Aug. 30, 1894, 94, 430.

BIG HATCHEE RIVER, NEAR BROWNSVILLE, TENN. (S.)

(Haywood County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 536.

Plans.

Approved July 16, 1898, 98, 536.

BIG HORN RIVER, MONT. (Across the). (A.)

(Bridge of the Northern Pacific R. R. Co.)

Engineers.

ENGINEER IN CHARGE: Capt. C. B. Sears. Report, 88, 2670.

Plans.

Bridge an obstruction; should be provided with a draw giving a free channel way of 100 f. width, 88, 2670.

BIG SANDY RIVER. (See Ohio River, etc.)

BIG SANDY RIVER, W. VA. (near the mouth of the). (A.)

(Chesapeake & Ohio R. R. Co.)

Engineers.

ENGINEER IN CHARGE. Capt. J. C. Post. Report, 88, 2578.

Plans.

Capt. Post recommended the removal of pile and cofferdam obstructions about one of the piers, 88, 2578.

BIG SANDY RIVER AT CATLETTSBURG, KY. (Sp.)

(Chesapeake & Ohio R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 93, 464; 95, 474.
ENGINEER IN CHARGE. Maj. D. W. Lockwood.

Plans.

To replace existing structure, approved Feb. 25, 1893, 93, 464. Modified plans, omitting the roadway and sidewalks, Nov. 23, 1894, approved Nov. 30, 1894, 95, 474.

Legislation.

Construction authorized by act of Feb. 15, 1893, 93, 464.

BIG SANDY RIVER FROM KENOVA, W. VA., TO CATLETTSBURG, KY. (Sp.)

(Ohio Valley Electric Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 697.

bridge by act of April 30, 1900, 1900, 697.

Plans.

Approved June 12, 1900, 1900, 697.

Legislation.

Company authorized to construct

BIG SANDY RIVER, TUG FORK (91 and 95½ miles above Catlettsburg, Ky.—Two bridges).

(Norfolk & Western R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, 91, 431.
ENGINEER IN CHARGE. Maj. D. W. Lockwood.

bridges by act of Feb. 9, 1891, 91, 431.

Plans.

Plans for the two bridges approved Feb. 13, 1891, 91, 431.

Legislation.

Company authorized to construct

BLACK CREEK, FLA. (S.)

(Walton County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 536.

Plans.

Approved July 9, 1898, 98, 536.

BLACK CREEK, CLAY COUNTY, FLA. (S.)

(Jacksonville, Tampa & Key West Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, 93, 470;
ENGINEER IN CHARGE. Lt. A. M. D'Armit.**Plans.**

Reconstruction plans approved Aug. 15, 1893, 93, 470.

BLACK RIVER. (See Monongahela River and)**BLACK RIVER, ELWOOD STREET, PORT HURON, MICH. (S.)**

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 533.

Plans.

Modified plans approved Oct. 26, 1897, 98, 533.

BLACK RIVER, TENTH STREET, PORT HURON, MICH. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 534.

Plans.

Approved June 29, 1897, 97, 534.

BLACK RIVER, LORAIN, OHIO. (S.)

(Lorain County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 621.

Plans.

Approved Oct. 19, 1898, 99, 621.

BLACK RIVER, POCAHONTAS, ARK. (Sp.)

(Pocahontas Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 618.

Plans.

Approved Nov. 17, 1898, 99, 618.

Legislation.

Company authorized to construct bridge by act of Apr. 21, 1898, 99, 618.

BLACK RIVER, SOUTH HAVEN, MICH. (A.)**Engineers.**

ENGINEERS IN CHARGE. Maj. W. Ludlow, 1889. Report, 89, 2800.

Plans.

Wooden bridge, narrow draw opening, partly obstructing navigation; an all-iron swinging bridge to take its place under consideration, 89, 2801.

BLACK RIVER, WASH. (S.)

(Seattle & Rainier Beach Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 531.

Plans.

Approved Sept. 11, 1896, 97, 531.

BLIND SLOUGH, OREG. (S.)

(Astoria & Columbia River R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 533.

Plans.

Plans submitted May 22, 1896, approved Mar. 8, 1897, 97, 533.

BOSTON HARBOR.—BOSTON AND CASTLE ISLAND (navigable waterway, Q street), MASS. (Sp., etc.)

(Board of park commissioners of Boston, Mass.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 402.

ENGINEER IN CHARGE. Lt. Col. S. M. Mansfield.

bridge under act of Sept. 19, 1890, sec. 7, and act of Massachusetts, 92, 402.

Plans.

Approved Dec. 12, 1891, 92, 402.

Legislation.

Commissioners authorized to construct

BOSTON HARBOR.—BOSTON TO EAST BOSTON. (S.)

Commerce.

Number of vessels that passed bridges across Charles and Mystic rivers in 1887, 68, 821. Commercial interests involved, 68, 822. Discussion by Col. Foster of the injury to navigation thereby, 68, 821; by Governor Bullock, 68, 826. Effect upon the interests of the U. S. navy-yard at Charlestown, 68, 823, 826.

Secretary of War on Senate bill 566. Views of Chief of Engineers, 68, 820.

Legislation.

Act of Massachusetts incorporating the Maverick Bridge Co., 68, 824; passed over governor's veto, 68, 823; veto message, 68, 826. Act of Massachusetts authorizing purchase by U. S. of navy-yard site, 68, 827.

Engineers.

CHIEF OF ENGINEERS. Report, 68, 69, Objections apparent, 68, 820. Senate Committee on Commerce asked views of

Plans.

By Maverick Bridge Co., 68, 821. Report of Lt. Col. Foster on plan, 68, 821.

BRANDYWINE RIVER (connecting Moylan avenue and Fourth street, Wilmington, Del.). (S.)

(New Castle County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Reconstruction plans approved Aug. 12, 1899, 99, 623.

BRANDYWINE CREEK (Fourth street extended, Wilmington, Del.). (Sp., etc.)

(Cherry Island Marsh Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 400.

ENGINEER IN CHARGE. Maj. W. F. Smith, U. S. agent.

under act of Sept. 19, 1890, sec. 7, and act of Delaware, 92, 400.

Plans.

Approved Oct. 26, 1891. Completion of bridge reported on May 12, 1892. 92, 400.

Legislation.

Company authorized to construct bridge

BRAVE BOAT HARBOR, BETWEEN KITTERY AND YORK, ME. (S.)

(Portsmouth, Kittery & York Street Rwy. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 534.

Plans.

Approved June 18, 1897, 97, 534.

BRAZOS RIVER, COLUMBIA, TEX. (S.)

(Brazoria County Bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 428.

ENGINEER IN CHARGE. Maj. A. M. Miller.

Plans.

Approved Feb. 12, 1894, 94, 428.

BREACH INLET, BETWEEN SULLIVANS ISLAND AND LONG ISLAND, S. C. (S.)

(Charleston Consolidated Ry., Gas & Electric Co. successors to the Charleston & Seashore R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 98, 536; 1900, 700.

Plans.

Original company's plans approved July 6, 1898, on condition that the draw-

span be increased to 40 f. width by Mar. 1, 1899, 98, 536. Condition not complied with; company's request of Sept. 20, 1899, to be relieved of this requirement granted Nov. 29, 1899, 1900, 700.

BRIDGEPORT, CONN. (See Coscob, etc.)**BROAD CREEK, NEAR LAUREL, DEL. (A.)**

(Philadelphia, Wilmington & Baltimore R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 335.

Plans.

Alteration of bridge draw made as required by act, June 6, 1888, 90, 335.

BRONX RIVER, WESTCHESTER AVENUE, NEW YORK CITY. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 534.

Plans.

Plans for a permanent and a temporary bridge approved Dec. 2, 1897, 98, 534.

BRONX RIVER, BELOW WEST FARMS, N. Y. (S.)

(Harlem River & Portchester R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 469.

ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.

Plans.

Reconstruction plans approved May 17, 1893, 93, 469.

BUCKHANNON RIVER. (See Ohio River, etc.)**BUFFALO BAYOU, TEX. (Sp.)**

(Galveston, La Porte & Houston Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 422.

Legislation.

Company authorized to construct bridge by act of Feb. 1, 1895, 96, 422.

Plans.

Approved Sept. 30, 1895, 96, 422.

BUFFALO BAYOU, HOUSTON, TEX. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 94, 428; 96, 424.

ENGINEER IN CHARGE. Maj. A. M. Miller.

Plans.

Approved Mar. 12, 1894, 94, 428. Plans for a bridge between Hill and Marsh streets in lieu of the one above (to connect Factory and Bayou streets), approved Sept. 4, 1895, 96, 424.

BUFFALO BAYOU, HOUSTON, TEX. (O.)

(Gulf, Colorado & Santa Fe Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 412.

Plans.

Specified alterations to railroad bridge

required on or before Oct. 11, 1892, 92, 412.

BUFFALO BAYOU, NEAR HOUSTON, TEX. (O.)

(San Antonio & Aransas Pass R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 473.

Plans.

Specified alterations required in 1892,

completed on or before Jan. 24, 1893, 93, 473.

BUFFALO BAYOU, NEAR HOUSTON, TEX. (S.)

(Harris County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 425.

Plans.

Approved Jan. 17, 1896, 96, 425.

BUFFALO BAYOU, SAN JACINTO STREET, HOUSTON, TEX.

(O.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 412.

Plans.

Specified alterations to highway bridge required on or before Oct. 14, 1892, 92, 412.

CACHE RIVER, ARK. (O.) (See Petit Jean River.)

(Choctaw, Oklahoma & Gulf R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 703.

Plans.

Specified alterations required on or before Aug. 1, 1900, 1900, 703.

CAHABA RIVER, IN BIBB COUNTY, ALA. (Sp.)

(Mobile & Ohio R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 530.

Plans.

Approved June 16, 1897, 97, 530.

Legislation.

Company authorized to construct bridge by act of June 11, 1896, 97, 530.

CAHABA RIVER, ALA. (8 and 16 miles above its mouth). (A.)
(Selma & New Orleans R. R. and the Alabama Central R. R.)

Engineers.

ENGINEERS IN CHARGE:

Maj. A. N. Damrell. Report, 88, 2551.

Capt. R. L. Hoxie. Report, 88, 2553.

Plans.

Descriptions of the bridges, 88, 2550.

Both bridges fixed structures, impassable during the navigable stage of the river; should have draw openings of 100 feet, 88, 2551, 2553.

CALCASIEU RIVER, LAKE CHARLES, LA. (S.)

(Kansas City, Shreveport & Gulf Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 531.

Plans.

Approved Sept. 14, 1896, 97, 531.

CALUMET RIVER, ILL. (A.)

Engineers.

ENGINEER IN CHARGE. Maj. T. H. Handbury. Report, 88, 2582, 2650.

Plans.

List of bridges forming an obstruction to the river, with changes suggested for each, 88, 2583, 2651.

CALUMET RIVER, SOUTH CHICAGO, ILL. (A.)

(Baltimore & Ohio R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 94, 430; 1900, 699.

ENGINEER IN CHARGE. Capt. W. L. Marshall, 1894.

Plans.

Reconstruction plans submitted Dec. 23, 1893, modified Jan. 26, 1894; approved Mar. 1, 1894, 94, 430.

Change in location of pier requested Oct. 5, 1899; approved Oct. 25, 1899, 1900, 699.

CALUMET RIVER, SOUTH CHICAGO, ILL. (Sp.)

(Lake Shore & Michigan Southern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 425.

ENGINEER IN CHARGE. Capt. W. L. Marshall.

bridge by act of Mar. 3, 1893, 94, 425.

Plans.

Plans submitted Dec. 23, 1893, modified Jan. 26, 1894; approved March 1, 1894, 94, 425.

Legislation.

Company authorized to reconstruct

CALUMET RIVER, SOUTH CHICAGO, ILL. (Sp.)

(Calumet & Blue Island Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 473.

ENGINEER IN CHARGE. Maj. W. L. Marshall.

Legislation.

Company authorized to construct bridge by act of Mar. 1, 1893. Amending act, June 8, 1894. 95, 473.

Plans.

Approved Oct. 3, 1894, 95, 473.

CALUMET RIVER, NINETY-FIFTH STREET, CHICAGO, ILL.

(S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 701.

Plans.

Reconstruction plans approved June 15, 1900, 1900, 701.

CALUMET RIVER, ILL. (Sp.)

(Hammond & Blue Island R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 424.

Legislation.

Company authorized to construct bridge by act of Mar. 28, 1896, 96, 424.

Plans.

Modified plans approved Aug. 11, 1896, 96, 424.

CALUMET RIVER, NEAR HYDE PARK (now annexed to the city of Chicago), ILL. (A.)

Engineers.

ENGINEER IN CHARGE. Capt. W. L. Marshall, 1889. Report, 89, 2799.

Plans.

Wagon-road bridge across the river obliquely, 89, 2799.

CALUMET RIVER, ILL., NEAR THE ILLINOIS AND INDIANA STATE LINE. (A.)

(Chicago & Calumet R. R. Co.)

Engineers.

ENGINEER IN CHARGE. Capt. W. L. Marshall, 1889. Report, 89, 2799.

upon completion of the Calumet River improvement as projected, would have one drawspan that could not be used at all, and the other would be contracted to 59 ft., which is too narrow, 89, 2799.

Plans.

The Chicago & Calumet R. R. bridge,

CALUMET (LITTLE CALUMET) RIVER, RIVERDALE, ILL. (S.)

(Pittsburg, Cincinnati, Chicago & St. Louis Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.

Approved Feb. 14, 1899, 99, 622.

CALUMET RIVER, HAMMOND, IND. (S.)

(Chicago, Indianapolis & Louisville Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Reconstruction plans for the superstructure and strengthening abutments approved Aug. 2, 1899, 99, 623.

CAMBRIDGE HARBOR, CAMBRIDGE, MD. (S.)

(Dorchester County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report 94, 429.
ENGINEER IN CHARGE. Maj. W. F. Smith, U. S. agent.

Plans.

Alteration plans approved July 11, 1894, 94, 429.

CANE RIVER, AT NATCHITOCHES, LA. (Sp.)

(Natchitoches Cane River Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 465.
ENGINEER IN CHARGE. Capt. J. H. Willard.

Legislation.

Construction authorized by act of Apr. 22, 1890. Amending act Jan. 9, 1893, 93, 465.

Plans.

Approved July 1, 1893. 93, 465.

**CANEY FORK RIVER, SMITH AND PUTNAM COUNTIES,
TENN. (Sp.)**

(Nashville & Knoxville R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 337.

Legislation.Authorized by acts of Mar. 3, 1885;
amended Feb. 25, 1889, 90, 337.**Plans.**Plan and location submitted, and approved by Secretary of War, Dec. 12, 1889,
90, 337.**CAPE FEAR RIVER, FAYETTEVILLE, N. C. (Sp.)**

(Yadkin Valley Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 369.

ENGINEER IN CHARGE. Capt. W. H.
Bixby.**Legislation.**Company authorized to construct bridge
by act of June 6, 1888, 89, 369.**Plans.**

Approved Dec. 1, 1888, 89, 369.

CAPE FEAR RIVER, NAVASSA, N. C. (S.)

(Wilmington Ry. Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 537.

Plans.Reconstruction plans approved Aug. 20,
1898, 98, 537.**CAPE FEAR RIVER (NORTHEAST BRANCH), HILTON,
N. C. (S.)**

(Wilmington Ry. Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 537.

Plans.Reconstruction plans approved Aug.
20, 1898, 98, 537.**CAPE FEAR RIVER (NORTHEAST), ABOVE WILMINGTON,
N. C. (A.)**

(Wilmington, Columbia & Augusta R. R. Co.)

Plans.

Captain Bixby recommended the removal of a sunken pier obstructing the draw, at the expense of the United States,

and that the railroad company be required to provide suitable fenders for the draw opening, 88, 2547.

**CASCO BAY, BETWEEN COUSINS AND LITTLEJOHNS
ISLANDS, ME. (S.)**

(Yarmouth bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 534.

Plans.Plans submitted May 10, 1895, approved
May 8, 1897, 97, 534.**CASPER (GASPER) RIVER, NEAR ITS MOUTH, KY. (O.)**

(Warren County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 411.

Plans.

Bridge to be raised 6 f., to make its clear height above pool level 24.6 f., on or before July 1, 1892, 92, 411.

CHARLES RIVER, MASS. (O. and A.)

Commerce.

Commercial interests affected, **90**, 3474.

Engineers.

CHIEF OF ENGINEERS. Report, **90**, 340.
BOARD OF ENGINEERS. Convened at Boston, Mass., Feb. 1, 1890, by S. O. No. 82, to report upon the bridges crossing Charles River which interfered with navigation.

Draw openings of the Charles River and Warren bridges of insufficient width. **90**, 3482. Descriptions of existing bridges, **90**, 3471, 3474.

Legislation.

Notices served upon bridge owners as to alterations required, **90**, 340.

CHARLES RIVER, BETWEEN THE RIVER'S MOUTH AND EAST CAMBRIDGE. (A.)

(Boston & Maine and the Eastern and Boston & Lowell railroads.)

Engineers.

ENGINEER IN CHARGE. Maj. C. W. Raymond. Report, **88**, 2528.

frequent passage of trains, not to be obviated by any practical alteration of the bridges, **88**, 2528.

Plans.

Delays in opening draws, caused by

CHARLES RIVER, BOSTON, MASS. (O.)

(Boston & Maine R. R. Co.; Eastern R. R. Co., controlled by Boston & Maine R. R. Co.; and Boston & Lowell R. R. Co., controlled by Boston & Maine R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **89**, 375.

Plans.

Alterations to 4 railroad bridges required by Jan. 1, 1891, **89**, 375.

CHARLES RIVER, BOSTON AND CAMBRIDGE, MASS. (S.)

(Boston & Maine R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **93**, 467.
ENGINEER IN CHARGE. Lt. Col. S. M. Mansfield.

1893; approved, Feb. 3, 1893, on condition that in 10 years the company rebuild on stone or iron piers all its bridges over Charles River, **93**, 467.

Plans.

Plans for alterations submitted Jan. 31,

CHARLES RIVER, BOSTON, MASS. (S.)

(Boston Transit bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **96**, 425.

Plans.

Reconstruction plans approved Dec. 27, 1895, **96**, 425.

CHARLES RIVER (West Boston Bridge), BETWEEN BOSTON AND CAMBRIDGE, MASS. (S. and Sp.)

(Cambridge City bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, **99**, 620; **1900**, 697.

Plans.

For temporary bridge to be used during reconstruction of West Boston bridge, approved Sept. 14, 1898, **99**, 620.

Legislation.

City authorized to construct new bridge by act of Mar. 29, 1900, **1900**, 697.

Plans for a drawless bridge to replace existing structure approved June 5, 1900, **1900**, 697.

CHARLES RIVER, AT BOSTON, MASS. (O.)

(Charles River bridge and Warren bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **89**, 735.**Plans.**Alterations required by Jan. 1, 1891, **89**, 375.**CHARLES RIVER, BOSTON (city limits). (O.)**

(Fitchburg R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **89**, 734.**Plans.**Alterations required by Jan. 1, 1891, **89**, 374.**CHARLES RIVER, MARKET AND ARSENAL STREETS, BOSTON, MASS. (Sp.)**

(City bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **92**, 407.

ENGINEER IN CHARGE. Lt. Col. S. M. Mansfield.

Legislation.City authorized to construct bridges under act of Sept. 19, 1890, **92**, 407.**Plans.**Plans for rebuilding the drawways approved July 20, 1892, **92**, 407.**CHARLES RIVER, WEST BOSTON, MASS. (O.)**

(West Boston bridge, and canal, or Craigies, bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **89**, 375, 376.**Plans.**Alterations required by Jan. 1, 1891, **89**, 376.**CHARLEVOIX HARBOR, MICH., BETWEEN ROUND LAKE AND LAKE MICHIGAN. (A.)**

(Iron highway bridge.)

Engineers.ENGINEER IN CHARGE. Maj. W. Ludlow, 1889. Report, **89**, 2800.**Plans.**No complaints made, although delay sometimes caused in opening the draw, from slowness, **89**, 2800.**CHATTAHOOCHEE RIVER, COLUMBIA, ALA. (Sp.)**

(City bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **96**, 423.**Plans.**Modified plans approved June 9, 1896, **96**, 423.**Legislation.**City authorized to construct bridge by act of April 16, 1896, **96**, 423.**CHATTAHOOCHEE RIVER, EUFAULA AND FORT GAINES, GA. AND ALA. (A.)**

(Two wagon bridges and the Southwestern R. R. Bridge.)

Engineers.ENGINEER IN CHARGE. Capt. R. L. Hoxie. Report, **88**, 2553.width with sheer booms recommended in each case, **88**, 2553.**Plans.**

The introduction of a draw of suitable

CHATTAHOOCHEE RIVER, AT OR NEAR GORDON, ALA.
(Sp.)

(Alabama Midland Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 372.
ENGINEER IN CHARGE. Capt. P. M. Price.

Legislation.

Company authorized to construct bridge by act of Aug. 6, 1888, 89, 372.

Plans.

Approved June 12, 1889, 89, 372.

CHEAT RIVER, POINT MARION, PA. (S.)

(State Line R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 466.
ENGINEER IN CHARGE. Lt. Col. A. Stickney.

Plans.

Approved Sept. 24, 1892, 93, 466.

CHEEHAN RIVER. (See Ashley River.)

CHEHALIS RIVER, BETWEEN ABERDEEN AND COSMOPOLIS, AND JOHNS RIVER, NEAR ITS CONFLUENCE WITH GRAYS HARBOR, WASH. (Sp.)

(Tacoma, Olympia & Grays Harbor Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 430.
ENGINEER IN CHARGE. Capt. T. W. Symons.

Legislation.

Company authorized to construct

bridges under act of Sept. 19, 1890, sec. 7, and act of Washington, 91, 430.

Plans.

Plans for the two bridges approved Feb. 9, 1891, 91, 430.

CHEHALIS RIVER, ELBOW RIFFLE, CHEHALIS COUNTY, WASH.

(County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 405.
ENGINEER IN CHARGE. Capt. T. W. Symons.

Legislation.

County authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Washington, 92, 405.

Plans.

Approved May 14, 1892, 92, 405.

CHELSEA CREEK, CHELSEA STREET, BOSTON, MASS. (S.)

(Boston City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 428.
ENGINEER IN CHARGE. Lt. Col. S. M. Mansfield.

Plans.

Plans for rebuilding bridge, approved May 7, 1894, 94, 428.

CHESTER CREEK. (See *Schuylkill River*.)**CHICAGO RIVER, CANAL STREET, CHICAGO, ILL. (O.)****Engineers.**

CHIEF OF ENGINEERS. Report, 91, 436.

BOARD OF ENGINEERS. Convened by S. O. No. 39, to examine and report upon bridge, recommended (1) the removal of the pivot pier, the protection wings or bridge rests, and all the adjuncts obstructing navigation; (2) the postponement of further construction until the river should

have been so widened as to provide for the full opening of the south draw; (3) that provision be made when the bridge is restored for maneuvering it by steam power, 91, 3864. (Majs. Ludlow and Davis and Capt. Marshall.)

Plans.

Alterations required by May 1, 1892, 91, 436.

CHICAGO RIVER, NORTH BRANCH, CLYBOURNE PLACE (near), CHICAGO, ILL. (S.)

(Chicago, Milwaukee & St. Paul Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 620.

Plans.

Reconstruction plans approved Sept. 20, 1898, 99, 620.

CHICAGO RIVER, NORTH BRANCH, DIVERSEY AVENUE, CHICAGO, ILL. (S.)

(Chicago City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 479.

ENGINEER IN CHARGE. Maj. W. L. Marshall.

Plans.

Approved June 22, 1895, 95, 479.

CHICAGO RIVER, NORTH BRANCH, FULLERTON AVENUE, CHICAGO, ILL. (S.)

(Chicago City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 479.

ENGINEER IN CHARGE. Maj. W. L. Marshall.

Plans.

Plans for reconstruction of bridge approved June 19, 1895, 95, 479.

CHICAGO RIVER, NORTH BRANCH, KINZIESTREET (near), CHICAGO, ILL. (Sp.)

(Chicago & North Western Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 432.

ENGINEER IN CHARGE. Capt. W. L. Marshall.

bridge under act of Sept. 19, 1890, sec. 7, and by Chicago, 91, 432.

Plans.

Approved Aug. 3, 1891, 91, 432.

Legislation.

Company authorized to construct

CHICAGO RIVER, NORTH BRANCH, NORTH HALSTED STREET, CHICAGO, ILL. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 425.

Plans.

Modified reconstruction plans approved Oct. 3, 1895, 96, 425.

CHICAGO RIVER, SOUTH BRANCH, CANAL STREET, CHICAGO, ILL. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 701.

Plans.

Plans for new bridge approved May 18, 1900, 1900, 701.

CHICAGO RIVER, SOUTH BRANCH, NEAR NINETEENTH STREET, CHICAGO, ILL. (A.)

(Pittsburg, Fort Wayne & Chicago R. R. Co.—Controlled by the Pennsylvania R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 472.
ENGINEER IN CHARGE. Capt. W. L. Marshall.

Plans.

Alteration plan partly meeting requirements, approved Feb. 11, 1893; work to be completed by May 1, 1893, 93, 472.

CHICAGO RIVER, SOUTH BRANCH, SOUTH HALSTED STREET, CHICAGO, ILL. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 467.
ENGINEER IN CHARGE. Capt. W. L. Marshall.

Plans.

Approved Jan. 13, 1893, 93, 467.

CHICAGO RIVER, SOUTH BRANCH, TAYLOR STREET, CHICAGO, ILL. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.

Reconstruction plans approved Mar. 10, 1899, 99, 622.

CHICAGO RIVER, SOUTH BRANCH, TAYLOR STREET (south of), CHICAGO, ILL. (S.)

(Chicago Terminal Transfer Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.

Reconstruction plans approved Jan. 13, 1899. Old bridge removed to new site and used pending reconstruction. 99, 622.

CHICAGO RIVER, SOUTH BRANCH (south fork of), ARCHER AVENUE, CHICAGO, ILL. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 533.

Plans.

Reconstruction plans approved Nov. 2, 1897, 98, 533.

CHICAGO RIVER, SOUTH BRANCH, CHICAGO, ILL. (S.)

(Van Buren street and the West Side Elevated R. R. Co., between Jackson and Van Buren streets, city bridges at.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 427.

ENGINEER IN CHARGE. Capt. W. L. Marshall.

Plans.

Plans were submitted conjointly by the city and railroad company. A hearing was given protesting parties, and in accordance with recommendation of Capt.

Marshall the city bridge at Van Buren street was authorized, Nov. 16, 1893, to be reconstructed and the railroad bridge, upon removal of obstructions caused by the existing Van Buren street bridge, to be constructed. 94, 427.

Application for a slight change in the approved location of piers was approved Mar. 27, 1894, 94, 427.

CHICAGO RIVER, SOUTH BRANCH (west fork of), SOUTH-WEST BOULEVARD, CHICAGO, ILL. (Sp., etc.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 406.

ENGINEER IN CHARGE. Capt. W. L. Marshall.

Legislation.

(City authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and by act of Illinois, 92, 406.

Plans.

Approved June 21, 1892, 92, 406.

CHICAGO RIVER, SOUTH BRANCH (west fork of), CHICAGO, ILL. (S.)

(Chicago & Northern Pacific R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 467.

ENGINEER IN CHARGE. Capt. W. L. Marshall.

Plans.

Approved Feb. 15, 1893, 93, 467.

CHICAGO RIVER, WELLS STREET BRIDGE (east of), CHICAGO, ILL. (S.)

(Lake Street Elevated R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 429.

ENGINEER IN CHARGE. Capt. W. L. Marshall.

Plans.

Approved July 13, 1894, 94, 429.

CHICAGO RIVER, WELLS STREET (east of), CHICAGO, ILL. (S.)

(North Western Elevated R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 428.

ENGINEER IN CHARGE. Capt. W. L. Marshall.

Plans.

Plans submitted Apr. 21, 1894, modified May 24, 1894; approved June 2, 1894, 94, 428.

CHINCOTEAGUE AND DELAWARE BAYS (canal between), DEL. (A.)

(Sussex County, temporary bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 430.

ENGINEER IN CHARGE. Maj. W. F. Smith, U. S. agent.

Plans.

Authority to construct temporary bridge granted June 20, 1894, by revocable license. License revoked Sept. 8, 1894, 94, 430.

CHIPPEWA RIVER. (See *St. Croix River*.)

CHIPPEWA RIVER, DURAND, WIS. (A.)
(Highway.)

Engineers. should be placed to assist vessels in passing the spans, **88**, 2637.
ENGINEER IN CHARGE. Maj. C. J. Allen.
Report, **88**, 2637.

Plans.
Maj. Allen reported that sheer booms

CHIPPEWA RIVER, DURAND, WIS. (O.)
(Chippewa Valley Bridge Co.)

Engineers. required on or before June 16, 1892. Time
CHIEF OF ENGINEERS. Report, **92**, 412. extended to Dec. 15, 1892. **92**, 412.

Plans.
Specified alterations to highway bridge

CHIPPEWA RIVER, NEAR RED CEDAR, WIS. (Sp., etc.)
(Chicago, Milwaukee & St. Paul Ry. Co.)

Engineers. bridge under act of Sept. 19, 1890, sec. 7,
CHIEF OF ENGINEERS. Report, **92**, 404. and act of Wisconsin, **92**, 404.

ENGINEER IN CHARGE. Maj. W. A. Jones.
Plans.
Plan for new bridge approved Apr. 16, 1892, **92**, 404.

Legislation.
Company authorized to construct

CHOCOLATE BAYOU, TEX. (S.) (See *Bastrop Bayou*.)
(Galveston, Brazos & Southwestern Ry. Co.)

Engineers. **Plans.**
CHIEF OF ENGINEERS. Report, **98**, 534. Approved Nov. 22, 1897, **98**, 534.

**CHOCTAWHATCHIE RIVER, NEAR GENEVA AND BELOW
NEWTON, ALA. (A.)**
(Wagon bridges.)

Engineers. **Plans.**
ENGINEER IN CHARGE. Capt. R. L. Hoxie. Report, **88**, 2553. Both bridges should be removed if river improvements be carried out, **88**, 2553.

CHOCTAWHATCHIE RIVER, NEAR NEWTON, ALA. (Sp.)
(Dale County bridge.)

Engineers. **Plans.**
CHIEF OF ENGINEERS. Report, **98**, 532. Approved May 31, 1898, **98**, 532.

Legislation.
County authorized to construct bridge by act of Feb. 14, 1898, **98**, 532.

**CHOCTAWHATCHEE RIVER, NEAR OLD HOLLIS BRIDGE,
ALA. (Sp.)**
(Dale County bridge.)

Engineers. **Plans.**
CHIEF OF ENGINEERS. Report, **98**, 532. Approved May 31, 1898, **98**, 532.

Legislation.
County authorized to construct bridge by act of Feb. 14, 1898, **98**, 532.

CHOPTANK RIVER, DENTON, MD. (S.)

(Queen Anne R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **97**, 532.**Plans.**Approved Sept. 23, 1896, **97**, 532.**CHRISTIANA RIVER, ON THE LINE OF THE RAILROAD IN NEWCASTLE COUNTY, DEL. (Sp., etc.)**

(Delaware R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **92**, 401.

ENGINEER IN CHARGE. Maj. W. F. Smith, U. S. agent.

Legislation.Company authorized to construct bridge by act of Sept. 19, 1890, **92**, 401.**Plans.**Reconstruction plans approved Dec. 8, 1891; modified plan, increasing width of draw span 5½ inches, and modifying the masonry construction, approved Jan. 28, 1892. Completion of bridge reported on July 5, 1892. **92**, 401.**CHRISTIANA AND THE ST. JONES RIVERS, WILMINGTON, DEL. (A.)****Engineers.**ENGINEER IN CHARGE. W. F. Smith, U. S. agent. Report, **88**, 2538, 2659.**Plans.**

W. F. Smith reported that the draw of

the Christiana Bridge should be worked by steam or some mechanical power, and that turning machinery should be put in both bridges over the St. Jones River, **88**, 2538, 2660.**CHRISTIANA RIVER, WILMINGTON, DEL.; AT WATSONS ISLAND, MD., ACROSS THE SUSQUEHANNA RIVER; BELOW POCOMOKE CITY, ACROSS THE POCOMOKE RIVER, MD., AND ACROSS THE INLAND WATERWAY FROM CHINCO-TEAGUE BAY, VA., TO DELAWARE, NEAR LEWES, DEL. (A.)****Engineers.**ENGINEER IN CHARGE. W. F. Smith, U. S. agent. Report, **88**, 2617, 2619.**Plans.**Description of the bridges and of the interference with navigation caused thereby, **88**, 2617, 2619.**CITY ISLAND AND PELHAM BAY PARK, CHANNEL BETWEEN, N. Y. (S.)**

(New York City bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **98**, 533.**Plans.**Reconstruction plans approved Oct. 29, 1897, **98**, 533.**CLARK RIVER. (See Lewis River and.)****CLATSKANIE CREEK, OREG. (S.)**

(Astoria & Columbia River R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **96**, 426.**Plans.**Approved June, 23, 1896, **96**, 426.**CLEAR CREEK, TEX. (Sp.)**

(La Porte, Houston & Northern R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **95**, 475.

ENGINEER IN CHARGE. Maj. A. M. Miller.

Legislation.Company authorized to construct bridge by act of Feb. 1, 1895, **95**, 475.**Plans.**Approved Mar. 25, 1895, **95**, 475.

CLEARWATER RIVER, NEAR KAMIAH, IDAHO. (S.)

(Clearwater Short Line Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 699.

Plans.

Approved, Oct. 25, 1899, 1900, 699.

CLEARWATER RIVER, LAPWAI CREEK (near mouth of), IDAHO. (S.)

(Clear Valley R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 700.

Plans.

Approved, Jan. 30, 1900, 1900, 700.

CLEARWATER RIVER, LEWISTON (about 11 miles above), IDAHO. (Sp.)

(Spokane & Paluse Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 431.
ENGINEER IN CHARGE. Capt. T. W. Symons.

bridge under act of Sept. 19, 1890, and act of Idaho, 91, 431.

Plans.

Approved, Mar. 28, 1891, 91, 431.

Legislation.

Company authorized to construct

CLINCH RIVER, KINGSTON, TENN. (Sp.)

(Roane County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 530.

Plans.

Approved June 10, 1897.

Legislation.

County authorized to construct bridge by act of June 9, 1897, 97, 530.

CLINCH RIVER, ROANE COUNTY, TENN. (S.)

(Tennessee Central R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 479.
ENGINEER IN CHARGE. Capt. T. A. Bingham.

Plans.

Approved June 20, 1895, 95, 479.

COAL BANK SLOUGH, COOS COUNTY, OREG. (Sp.)

(Coos Bay, Roseburg & Eastern R. R. & Navigation Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 432.
ENGINEER IN CHARGE. Capt. T. W. Symons.

Plans.

Approved June 11, 1891. On Aug. 20, 1891, completion of bridge reported. 91, 432.

Legislation.

Company authorized to construct bridge by act of Mar. 3, 1891, 91, 432.

COHANSEY CREEK, BRIDGETON, N. J. (S.)

(Cumberland County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 426.

Plans.

Approved Oct. 31, 1895. Modified plans to reduce the draw opening approved Feb. 7, 1896. 96, 426.

COHASSET NARROWS (so called), BETWEEN WAREHAM AND BOURNE, MASS. (Sp., etc.)

(Plymouth and Barnstable counties' bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 404.

ENGINEER IN CHARGE. Capt. W. H. Bixby.

Legislation.

Counties authorized to construct bridge under acts of Sept. 19, 1890, sec. 7, and act of Massachusetts, 92, 404.

Plans.

Approved Apr. 14, 1892, 92, 404.

COLUMBIA RIVER, BETWEEN DOUGLAS AND KITTITAS COUNTIES, WASH. (Sp.)

(St. Paul, Minneapolis & Manitoba Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 464.

ENGINEER IN CHARGE. Capt. T. W. Symons.

Legislation.

Construction authorized by act of Jan. 10, 1893, 93, 464.

Plans.

Submitted Sept. 30, 1892, approved Feb. 14, 1893, 93, 464.

COLUMBIA RIVER, NORTHPORT, WASH. (Sp.)

(Columbia & Red Mountain Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 531.

Legislation.

Company authorized to construct bridge by act of Jan. 27, 1897, 98, 531.

Plans.

Approved Sept. 30, 1897, 98, 531.

COLUMBIA RIVER, NEAR VANCOUVER, WASH. (Sp.)

(Oregon Ry. Extensions Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 429.

ENGINEER IN CHARGE. Maj. T. H. Handbury.

Legislation.

Company authorized to construct bridge by act of Aug. 24, 1890, 91, 429.

Plans.

Approved Sept. 29, 1890, 91, 429.

COMMENCEMENT BAY, TACOMA, WASH. (O.)

(Northern Pacific R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 412.

Plans.

Specified alterations to railroad bridge required on or before Mar. 1, 1893, 93, 412.

CONECUH RIVER, HENLEYS FERRY, NEAR BREWERTON, AND AT PARKERS FERRY, ALA. (Sp.)

(Escambia County bridges.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 697.

Legislation.

County authorized to construct bridges by act of March 2, 1899, 1900, 697.

Plans.

Approved Sept. 19, 1899, 1900, 697.

CONEY ISLAND CREEK, FROM WEST SEVENTEENTH STREET TO WEST EIGHTEENTH STREET, N. Y. (S.)

(Brooklyn City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 534.

Plans.

Approved May 28, 1897, 97, 534.

CONGAREE RIVER, NEAR COLUMBIA, S. C. (S.)

(South Bound R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Approved Aug. 4, 1899, 99, 623.

CONNECTICUT RIVER. (See Coscob, etc.)

CONNECTICUT RIVER, BETWEEN HARTFORD AND EAST HARTFORD, CONN. (A. and O.)

(State bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 480, 483.

Draw with span 100 f. in clearance, at the third span from Hartford shore, to be completed on or before Oct. 1, 1895, 95, 483.

Plans.

Alteration plans approved Dec. 28, 1894, 95, 480.

CONNECTICUT RIVER, MIDDLETOWN, CONN. (O.)

(New York, New Haven & Hartford R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 429.

Plans.

Specified alterations to be completed within two months from July 2, 1896, 96, 429.

CONNECTICUT RIVER, BETWEEN MIDDLETOWN AND PORTLAND, CONN. (S.)

(Middletown & Portland Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 480.
ENGINEER IN CHARGE. Col. H. M. Robert.

Plans.

Approved Aug. 6, 1895, modified plans approved Aug. 28, 1895, 95, 480.

CONTENTNIA CREEK, NEAR GRIFTON, N. C. (Sp.)

(Wilmington & Weldon R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 426.
ENGINEER IN CHARGE. Maj. W. S. Stanton.

Legislation.

Company authorized to construct bridge by act of Aug. 23, 1894, 94, 426.

Plans.

Approved Aug. 29, 1894, 94, 426.

COOPER CREEK, FEDERAL STREET, CAMDEN, N. J. (O.)

(City & Camden Horse R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 412.

Plans.

Specified alterations required of city and railroad company on or before Sept. 30, 1892, 92, 412.

COOPER CREEK, STATE STREET, CAMDEN, N. J. (S.)

(Camden County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 536.

Plans.

Reconstruction plans approved June 16, 1898, 98, 536.

COOSA RIVER, GA. AND ALA. (A.)

Central R. R. of Georgia; Talladega & Coosa Valley R. R.; Georgia Pacific R. R.; and Annison & Cincinnati R. R.—4 bridges.

Engineers.

ENGINEER IN CHARGE. Capt. P. M. Price, 1889. Report, 89, 2797.

Plans.

Three of the bridges are too low and have no draw; the other one has a draw that will not work, 89, 2797.

COOSAWATEE RIVER, GA. (See Oostenaula River and —.)**CORDELIA SLOUGH, CAL. (See Pacheco Slough.)****CORPUS CHRISTI CHANNEL (MORRIS AND CUMMINGS SHIP CHANNEL), TEX. (Sp.)**

(Arkansas Harbor Terminal Rwy. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 530.

bridge by act of May 4, 1896, 97, 530.

Legislation.

Company authorized to construct

Plans.

Approved Apr. 21, 1897, 97, 530.

COSCOB, CONN.; BRIDGEPORT, CONN.; HOUSATONIC RIVER, CONN.; NEW HAVEN, ON THE QUINNIPIAC RIVER, CONN.; MIDDLETOWN, ON THE CONNECTICUT RIVER, CONN.; THE CITY BRIDGES AT BRIDGEPORT; THE CITY AND THE TOMLINSON BRIDGES AT NEW HAVEN, CONN. (A.)

(New York, New Haven & Hartford R. R. Co.)

Commerce.

Protests of commercial interests against bridges 2, 4, 5, 7, and 8, 88, 2535, 2537.

Engineers.

ENGINEER IN CHARGE. Lt. Col. W. McFarland. Report, 88, 2532.

Plans.

Lt. Col. McFarland proposed to widen

the clear way at bridges 3 and 5 by removal of certain under-water portions of the piers; to require the introduction of draws at bridges 4 and 7, and the widening of the draw at bridge 8, and to secure, with steam power, a more expeditious opening and closing of the draws at bridges 1 and 2, 88, 2532, 2534.

COW BAYOU, ABOUT 6 MILES ABOVE ITS CONFLUENCE WITH SABINE RIVER, TEXAS. (S.)

(Orange County bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 93, 470; 94, 426.

ENGINEER IN CHARGE. Maj. A. M. Miller.

Plans.

Approved July 6, 1893, 93, 470. New plans approved Oct. 6, 1893. 94, 426.

COWLITZ RIVER, TOLEDO, WASH. (Sp., etc.)
(Lewis County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 401.

ENGINEER IN CHARGE. Maj. T. H. Handbury.

Legislation.

County authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Washington, 92, 401.

Plans.

Approved Nov. 19, 1891, 92, 401.

CUMBERLAND RIVER. (See Ohio River.)

CUMBERLAND RIVER, CLARKSVILLE, TENN. (S.)
(Louisville & Nashville R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 536.

Plans.

For floating cribs, between center pier

and rest piers of drawspan; approved, June 16, 1898, 98, 536.

CUMBERLAND RIVER, NASHVILLE, TENN. (Sp.)
(Wagon bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 88, 308, 2439.

Legislation.

Authorized by act of Mar. 3, 1887, 88, 2438.

Plans.

Description of proposed bridge, 88, 2440. Modification made and approved, 88, 2441. Lt. Col. Barlow did not consider that the bridge as proposed would form any obstruction to navigation, 88, 2441.

CUYAHOGA RIVER, CLEVELAND, OHIO. (S.)
(Cleveland, Cincinnati, Chicago and St. Louis Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.

Reconstruction plan approved Jan. 30, 1899, 99, 622.

DARBY CREEK. (See Schuylkill River.)

DEEP RIVER, WAHKIAKUM COUNTY, WASH. (S.)
(County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 699.

Plans.

Approved Oct. 11, 1899, 1900, 699.

DELAWARE BAY. (See Chincoteague Bay and—)

DELAWARE RIVER, PHILADELPHIA, PA. (Sp.)
(Pennsylvania and New Jersey R. R. Co. of New Jersey.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 474.

ENGINEER IN CHARGE. Maj. C. W. Raymond.

Legislation.

Company authorized to construct bridge by act of June 14, 1894, 95, 474.

Plans.

Plans submitted Aug. 30, 1894, modified Oct. 11, 1894; approved Nov. 3, 1894, 95, 474.

DELAWARE RIVER, BETWEEN PHILADELPHIA AND CAMDEN. (Sp.)

Engineers.

CHIEF OF ENGINEERS. Reports, 71, 81; 717.

BOARD OF ENGINEERS. Convened at Philadelphia May 10, 1870. Proceedings, 71, 709. Reconvened Oct. 15, 1870. Report, 71, 710, 713, 718. Reconvened at Philadelphia, Dec. 7, 1870, and Apr. 29, 1871, 71, 713, 718. (Lt. Cols. Woodruff and Kurtz, and Capt. King.)

Legislation.

Bridge authorized by act of Apr. 6, 1870; requirements of act, 71, 81.

Plans.

Of Philadelphia & Camden Bridge Co. described, 71, 110. Comments of board, 71, 111, 710, 718. Approved by Secretary of War, 71, 718.

DES GLAISES BAYOU, LA. (Sp.)

(St. Louis, Avoyelles & Southwestern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 423.

Legislation.

Company authorized to construct bridge by act of Aug. 23, 1894, 96, 423.

Plans.

Approved Oct. 26, 1895; modified plans submitted Dec. 22, 1895, providing for a wooden drawspan in lieu of one of iron required by approved plans; approved Jan. 15, 1896, 96, 423.

DETROIT, MICH., CHANNEL BETWEEN LAKES HURON AND ERIE, across the.

Commerce.

Waterway fully described, 74, 588.

Tables of tonnage on the lakes and elsewhere, 74, 590, et seq.; 74, 619.

Railroad ferry crossing, 74, 594, et seq.; 74, 634.

High and low bridges discussed, 74, 630.

History of proposed tunnel, 74, 598, 608, 619, 631.

Rates on freight, 74, 599.

Freights, etc., Michigan Central R. R. Co., 74, 600.

Statements of various parties for and against proposed bridge, 74, 613, 620-631, 633-636. Railroad interests presented by J. F. Joy, president Michigan Central R. R. Co., 74, 604.

Memorial to Congress for double track railroad from Chicago to New York, 74, 610.

Memorial to legislature of Michigan against bridging Detroit River, 74, 617.

Proposals of railroad companies, 74, 630.

Statistics, 74, 611; 80, 1857, 1862.

Engineers.

CHIEF OF ENGINEERS. Reports, 74, 71; 80, 199.

BOARDS OF ENGINEERS:

Convened at Detroit, Mich., May 12,

1873, and heard opinions of the opposing interests. Reconvened Nov. 14; reported against a draw bridge and favorably to high bridge or tunnel. Conclusions of the board, 74, 603. Report, 74, 587. (Majs. Warren, Comstock, Weitzel, and Merrill, and Capt. Livermore.)

Convened at Detroit Oct. 14, 1879, 80, 1853. Tunnel under the river the most satisfactory solution. If bridge be built it should be provided with a draw span of not less than 300 f. Fixed spans not less than 450 f. in the clear, with 60 f. headway. 80, 1855. Maj. Wilson did not concur in plan of bridge with draw, 80, 1856. (Lt. Cols. Reynolds and Michler, and Majs. Poe, Houston, and Wilson.)

Plans.

Of bridges described and discussed by Board of Engineers, 74, 600.

By bridge company. (1) Low bridge with two draws; estimate, \$2,457,550. 74, 628. (2) For bridge 150 f. above ordinary water surface; estimate, \$8,947,000, 74, 628. (3) For winter bridge with one draw and two movable spans of 400 f. each, to be removed during the season of navigation; estimate, \$1,966,500, 74, 629.

Described and discussed by Board of Engineers, 80, 1854.

DETROIT RIVER.

(Belle Isle and the American shore.)

Commerce.

Conservation of navigable waters by the U. S., 85, 292, 1918.

Engineers.

CHIEF OF ENGINEERS. Reports, 85, 292, 1918.

DETROIT RIVER, across the.

(Detroit, Mich.)

Commerce.

Shipping interests, 90, 3457.

Engineers.

CHIEF OF ENGINEERS. Report, 90, 3456.

BOARD OF ENGINEERS. Convened at Detroit, Mich., July 19, 1889, by S. O.

No. 15, to report upon the practicability and necessity of a bridge over Detroit River at Detroit. The Board reported the construction of such a bridge feasible, and, of the projects submitted to them, recommended that for a high bridge. Report. 90, 3456, 3463. (Col. Poe and Majs. Allen and Adams.)

DETROIT RIVER (west channel). (Sp.)

(Belle Isle Park and the mainland.)

Engineers.

CHIEF OF ENGINEERS. Report, 88, 308; 97, 529.

Legislation.

Bridge authorized by act of July 20, 1886, 88, 2456.

Plans.

Proposed location and dimensions of bridge and approaches, 88, 2452.

Lt. Col. Poe approved location and construction of bridge as designed, 88, 2451.

Reconstruction plans approved Apr. 8, 1897, 97, 529.

DICKINSON BAYOU, TEX. (O.)

(Galveston, Houston & Henderson R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 473.

Plans.

Specified alterations required on or before May 20, 1893, 93, 473.

DICKINSON BAYOU, TEX., ABOUT ONE-HALF MILE ABOVE ITS MOUTH. (S.)

(North Galveston, Houston & Kansas City R. R.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 466.
ENGINEER IN CHARGE. Maj. C. J. Allen.

Plans.

Approved Oct. 13, 1892, 93, 466.

DOG AND FOWL RIVERS, ALA. (S.)

(Mobile & Dauphin Island R. R. & Harbor Co.)

Engineers.

CHIEF OF ENGINEERS. Report. 94, 426.
ENGINEER IN CHARGE. Maj. A. N. Damrell.

Plans.

Approved Nov. 3, 1893, 94, 426.

DUCK RIVER, COLD BRANCH FERRY, TENN. (S.)

(Humphreys County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 424.

Plans.

Approved Sept. 12, 1895, 96, 424.

DULUTH HARBOR, CANAL AT AT ENTRANCE, DULUTH, MINN. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 410.

BOARD OF ENGINEERS. Constituted by S. O. No. 6, Feb. 1, 1892, to examine and report upon the plans of a bridge over the entrance to Duluth Harbor, on Lake street, submitted by the board of public works of the city of Duluth, Minn. Report. 92, 3315. (Col. O. M. Poe, Majs. W. Ludlow and W. A. Jones.)

Legislation.

City authorized to construct bridge by Minnesota, 92, 410.

Plans.

Plans for a lift bridge, referred to Board of Engineers; public hearing given interested parties; Chief of Engineers concurred in recommendation of Board of Engineers and the plans disapproved Apr. 11, 1892, 92, 410.

DUTCH KILLS CREEK, LONG ISLAND CITY, N. Y. (S.)

(Long Island R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **93**, 469.
 ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.

Plans.

Reconstruction plans approved Mar. 27, 1893, **93**, 469.

DUWAMISH RIVER, KINGS COUNTY, WASH. (S.)

(County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **1900**, 700.

Plans.

Approved Mar. 29, 1900, **1900**, 700.

DUWAMISH RIVER, SEC. 29, T. 24 N., R. 4 E., WASH. (Sp., etc.)

(Valley Street Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **92**, 400.
 ENGINEER IN CHARGE. Capt. T. W. Symons.

under act of Sept. 19, 1890, sec. 7, and act of Washington, **92**, 400.

Plans.

Approved Oct. 17, 1891; completed Mar. 4, 1892, **92**, 400.

Legislation.

Company authorized to construct bridge

DUWAMISH RIVER, NEAR SEATTLE, WASH. (Sp.)

(Northern Pacific & Puget Sound Shore R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **91**, 431.
 ENGINEER IN CHARGE. Capt. T. W. Symons.

under act of Sept. 19, 1890, sec. 7, and act of Washington, **91**, 431.

Plans.

Approved Mar. 6, 1891, **91**, 431.

Legislation.

Company authorized to construct bridge

EAST RIVER, BETWEEN NEW YORK CITY AND LONG ISLAND. (Sp.)

(New York & Long Island Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **88**, 309.

Plans.

Plan and location of proposed bridge approved by Secretary of War, **88**, 2472.

Legislation.

Bridge authorized by act of Mar. 3, 1887, **88**, 2471.

EAST RIVER (bridge No. 3), NEW YORK, N. Y. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **1900**, 700.

Plans.

Approved Jan. 29, 1900, **1900**, 700.

EAST RIVER, BETWEEN NEW YORK AND BROOKLYN. (Sp.)

(New York Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, **69**, 56, 395.

Legislation.

Company authorized to construct bridge by act of March 3, 1869, **69**, 404.

Plans.

BOARD OF ENGINEERS. Constituted by S. O. No. 72, convened at New York, May 22, 1869, to examine and report upon the proposed bridge between New York and Brooklyn. Report, **69**, 397. (Lt. Cols. H. G. Wright and J. Newton, and Maj. W. R. King.)

Plans approved June 19, 1869. Height of center span to be 135 f. clear, m. l. w. **69**, 405.

EAST RIVER, BETWEEN NEW YORK AND BROOKLYN, N. Y. (S.)

(East River Bridge Co.—one above and one below the navy-yard.)

Engineers.

CHIEF OF ENGINEERS. Reports, **93**, 467; **97**, 532.

ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.

Plans.

Plans submitted Oct. 15, 1892, provided for a clearance of 135 f. at the center of the spans and 120 f. at the piers above m. h. w.; a Board of Engineers recommended a clearance of 145 f. at center of spans, and the Secretary of War, Jan. 17, 1893, prescribed a clearance of 140 f. at m. h. w. under the most unfavorable condi-

tions at the center of the span of the upper bridge. Plans in accordance submitted Jan. 19, 1893; approved Feb. 16, 1893. **93**, 467. New York City, having acquired the rights and franchises of upper bridge, submitted new plans Jan. 10, 1896; Board of Engineers recommended, Feb. 26, 1896, a clearance of 135 f. at m. h. spring tides, for 200 f. on each side of the middle point, and height of 117 f. at least, at the pier head lines; plans in accordance submitted Sept. 15, 1896, approved Sept. 24, 1896, **97**, 552.

EAST RIVER, GREEN BAY CITY, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, **96**, 426; **97**, 532.

Plans.

Reconstruction plans approved May 1,

1896, **96**, 426. Modified plans reducing the draw opening approved Oct. 13, 1896. **97**, 532.

EBEY SLOUGH, WASH. (See Snohomish River.)

EDISTO RIVER, NEAR BRANCHVILLE, S. C. (A.) (See Ashley River, etc.)

(State bridge.)

Engineers.

ENGINEER IN CHARGE. Capt. F. V. Abbot, 1899. Report, **99**, 2795.

Plans.

Should be a raft span of at least 60 f. in the clear, **99**, 2796.

ELBOW RIFFLE. (See Chehalis River.)

ELIZABETH RIVER, SOUTH BRANCH, VA. (S.)

(Southern Branch Drawbridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **99**, 622.

Plans.

Approved Mar. 10, 1899, **99**, 622.

ELIZABETH RIVER, SOUTHERN BRANCH, NORFOLK, VA. (S.)

(Southeastern & Atlantic R. R. Co.—Location abandoned by the New York, Philadelphia & Norfolk R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, **97**, 533; **98**, 534.

Plans.

The grantees' plans approved Feb. 8,

1897, **97**, 533. The location having been abandoned by the grantees, plans of the Southeastern & Atlantic R. R. Co., submitted Nov. 12, 1897, were approved Nov. 26, 1897, **98**, 534.

ELIZABETH RIVER, VA., EASTERN AND SOUTHERN BRANCHES. (A.)

(Norfolk & Western R. R. Co. at Norfolk, Va.)

Engineers.

ENGINEER IN CHARGE. Capt. F. A. Hinman. Report, 88, 2542, 2543, 2622.

Plans.

Details of modification of bridge as proposed by the R. R. Co., 88, 2623. Cor-

respondence in relation thereto, 88, 2624-2628. Draw opening too narrow and badly located. Draw openings should be 60 f. wide and relocated at the deep channel. 88, 2543.

ELIZABETH RIVER, WESTERN BRANCH, BETWEEN WEST NORFOLK AND PORT NORFOLK, VA. (S.)

(West Norfolk & Port Norfolk Drawbridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 429.

ENGINEER IN CHARGE. Lt. E. Burr.

Plans.

Plans submitted Feb. 26, 1894, modified June 9, 1894; approved June 23, 1894, 94, 429.

ELK RIVER, ELK RIVER MILLS, ALA. (Sp., etc.)

(Limestone County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 402.

ENGINEER IN CHARGE. Capt. G. W. Goethals.

Legislation.

County authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and by act of Alabama, 92, 402.

Plans.

Approved Dec. 9, 1891; completion of bridge reported on Jan. 27, 1892, 92, 402.

ELK RIVER, CHARLESTON, W. VA. (A.)

(Suspension wagon bridge and Ohio Central R. R. bridge.)

Engineers.

ENGINEER IN CHARGE. Lt. Col. W. P. Craighill. Report, 88, 2570.

Plans.

Description, 88, 2572.

In view of the nature of the navigation and the limited improvement undertaken by the United States, Lt. Col. Craighill reported action unnecessary, 88, 2574.

ELK RIVER, CLAY COUNTY, W. VA. (S.)

(County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 621.

Plans.

Approved Dec. 8, 1898, 99, 621.

ELK RIVER, CLENDENNIN, W. VA. (S.)

(Kanawha County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 429.
ENGINEER IN CHARGE. Col. W. P. Craighill.

Plans.

Plans submitted Feb. 12, 1894; modified June 16, 1894; approved June 23, 1894, 94, 429.

EMBARRASS RIVER, NEW LONDON, WIS. (S.)

(Chicago & Northwestern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 621.

Plans.

Approved Jan. 7, 1899, 99, 621.

EUREKA SLOUGH, HUMBOLDT COUNTY, CAL. (S.)

(California & Northern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 701.

Plans.

Approved June 29, 1900, 1900, 701.

**FAR ROCKAWAY BAY, ROCKAWAY INLET, BETWEEN
HICKS BEACH AND SHELTER ISLAND, N. Y. (S.)**

(Ocean Causeway Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 479.
ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.

Plans.

Plans submitted Aug. 15, 1894; modified May 9, 1895; approved July 16, 1895, 95, 479.

FAR ROCKAWAY BAY, N. Y. (O.)

(Far Rockaway Ferry & Improvement Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 538.

Plans.

Alterations requiring a clear draw of 35 f. to be completed Oct. 15, 1897, 98, 538.

FISHING CREEK, N. C. (Sp.)

(Frank Hitch.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 697.

Plans.

Approved Apr. 30, 1900, 1900, 697.

Legislation.

Mr. Hitch authorized to construct bridge by act of Mar. 1, 1900, 1900, 697.

FLINT RIVER, DRAYTON, GA. (A.)

(Wagon bridge.)

Engineers.

ENGINEER IN CHARGE. Capt. R. L. Hoxie. Report, 88, 2552.

Plans.

Capt. Hoxie recommended the insertion of a draw of suitable width, 88, 2552.

FLINT RIVER, NEAR BAINBRIDGE, GA. (Sp.)

(Alabama Midland Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 372.

Legislation.

Company authorized to construct bridge by act of Aug. 6, 1888, 89, 372.

ENGINEER IN CHARGE. Capt. P. M. Price.

Plans.

Approved June 12, 1889, 89, 372.

**FLUSHING CREEK, N. Y., NEAR THE BRIDGE STREET
STATION ON THE WHITESTONE BRANCH OF THE LONG
ISLAND R. R. (O.)**

(Long Island R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 483.

in direction of the axis of the stream, with a clear width of 40 f. in the draw and between the guard piling; to be completed on or before Mar. 1, 1896, 95, 483.

Plans.

Required a straight channel practically

FORE RIVER MOUTH, PORTLAND HARBOR, ME. ("Portland Bridge"). (A. and O.)

(Cumberland County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 472, 474.

ENGINEER IN CHARGE. Lt. Col. P. C. Hains.

Plans.

Alteration plans, required under act of Sept. 19, 1890, approved Apr. 10, 1893, 93, 474.

FORKED DEER RIVER, SOUTH FORK, YELLOW BLUFF, TENN. (S.)

(Dyer County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 620.

Plans.

Approved Sept. 12, 1898, 99, 620.

FORT BAYOU, MAIN CHANNEL, OCEAN SPRINGS, MISS. (Sp., etc.)

(Ocean Springs Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 402.

ENGINEER IN CHARGE. Maj. A. N. Damrell.

under act of Sept. 19, 1890, sec. 7, and act of Mississippi, 92, 402.

Plans.

Approved Dec. 14, 1891, 92, 402.

Legislation.

Company authorized to construct bridge

FORT POINT CHANNEL, BOSTON, MASS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 533.

Plans.

Approved Sept. 23, 1897, 98, 533.

FORT POINT CHANNEL, BOSTON, MASS. (A.)

(New York & New England R. R. Co.)

Engineers.

ENGINEERS IN CHARGE:

Maj. C. W. Raymond. Report, 88, 2527.

Lt. Col. G. L. Gillespie. Report, 88, 2608.

draw openings to a least width of 42½ f. and to change the direction of the draw pier, 88, 2527.

Lt. Col. Gillespie reported that to provide for the projected increase in channel depth the existing pivot pier would have to be reconstructed with draw openings of 43 f., 88, 2609.

Plans.

Maj. Raymond proposed to widen the

FORT POINT CHANNEL (Broadway Bridge), BOSTON, MASS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 701.

Plans.

Reconstruction plans for part of pier approved June 14, 1900, 1900, 701.

FORT POINT CHANNEL, BOSTON HARBOR, MASS. (S.)

(Bridges of the Boston & Providence R. R. Corporation; the Old Colony R. R. Co.; and the New York, New Haven & Hartford R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Plans for two bridges approved Mar. 28, 1898, 98, 535.

FORT POINT CHANNEL, DOVER STREET, BOSTON, MASS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 470.
ENGINEER IN CHARGE. Lt. Col. S. M. Mansfield.

Plans.

Reconstruction plans approved, July 12, 1893, 93, 470.

FORT POINT CHANNEL. (Across.)

(Bridge of the Old Colony R. R. Co. at Boston Mass.)

Engineers.

ENGINEER IN CHARGE. Maj. C. W. Raymond. Report, 88, 2527.

Plans.

Maj. Raymond reported that the in-

terference with free navigation is caused by the delay in opening the draws, due to the great number of passing trains; on alteration of the bridge is necessary, 88, 2527.

FOURCHE LE FERRE, RIVER, ARK. (Sp.)

(Choctaw & Memphis R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 619.

Legislation.

Company authorized to construct

bridge by act of Jan. 10, 1899, 99, 619.

Plans.

Approved, March 13, 1899, 99, 619.

FOWL RIVER, ALA. (See Dog River.)

FOX RIVER, NEAR GOVERNORS BEND LOCK, WIS. (S.)

(Fort Winnebago bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 476.
ENGINEERS IN CHARGE:
Maj. J. F. Gregory.
Capt. C. F. Palfrey.

Plans.

Plans submitted Aug. 25, 1894, approved Sept. 15, 1894. Modified plans approved Feb. 6, 1895. Bridge completed. 95, 476.

FOX RIVER, MAIN STREET, GREEN BAY, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 532.

Plans.

Reconstruction plans approved Oct. 14, 1896, 97, 532.

FOX RIVER, BETWEEN GREEN BAY AND FORT HOWARD, WIS. (S.)

(Chicago & Northwestern Ry. Co., and the Kewaunee, Green Bay & Western R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 95, 478.
ENGINEER IN CHARGE. Capt. C. F. Palfrey.

Plans.

Approved Feb. 5, 1895, 95, 478.

FOX RIVER, MENASHA, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 533.

Plans.

Reconstruction plans approved Dec. 29, 1896, 97, 533.

FOX RIVER, OMRO, WIS. (S.)

(Chicago, Milwaukee & St. Paul Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 621.

Plans.

Reconstruction plans approved Jan. 10, 1899, 99, 621.

FOX RIVER, OSHKOSH, WIS. (S.)

(Chicago & Northwestern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 620.

Plans.

Reconstruction of plans approved Sept. 9, 1898, 99, 620.

FOX RIVER, WISCONSIN AVENUE, OSHKOSH, WIS. (Sp., etc.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 403.

ENGINEER IN CHARGE. Maj. J. F. Gregory.

Legislation.

City authorized to construct bridge un-

der act of Sept. 19, 1890, sec. 7, and act of Wisconsin, 92, 403.

Plans.

Approved Feb. 1, 1892, 92, 403.

FOX RIVER, U. S. CANAL, LAKE STREET, APPLETON, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 533.

Plans.

Reconstruction plans of superstructure approved Oct. 12, 1897, 98, 533.

FOX RIVER AND CANAL DE PERE, WIS. (S.)

(De Pere City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 427.

ENGINEER IN CHARGE. Maj. J. F. Gregory.

Plans.

Plans for new bridge approved Feb. 1, 1894, 94, 427.

FOX RIVER AND GOVERNMENT CANAL, DE PERE, WIS. (Sp., etc.)

(Chicago & Northwestern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 409.

ENGINEER IN CHARGE. Maj. J. F. Gregory.

Legislation.

Company authorized to construct

bridge under act of July 13, 1892, sec. 3, and act of Wisconsin, 92, 409.

Plans.

Modified plan approved Aug. 30, 1892, 92, 409.

FOX RIVER AND CANAL, KAUKAUNA, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 427.

ENGINEER IN CHARGE. Maj. J. F. Gregory.

Plans.

Approved Dec. 11, 1893. Reported completed. 94, 427.

FOX RIVER AND THE PORTAGE CANAL, WIS. (A.)

Engineers.

ENGINEER IN CHARGE. Capt. W. L. Marshall. Report, 88, 2579.

Plans.

List of bridges obstructing the river and the canal; remedies or modifications proposed by Capt. Marshall, 88, 2578.

FRANKFORD CREEK. (See Schuylkill River, etc.)

FRANKFORD CREEK, PA. (O.)

(Kerlaington & Tacony R. R.—Pennsylvania Railroad Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 703.

Plans.

Required a clear channel width of 24 f. and h. w. clearance of 10 f. on or before Oct. 31, 1900, 1900, 703.

FRANKFORD CREEK, PHILADELPHIA, PA. (S.)

(Philadelphia Belt Line R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 466.
ENGINEER IN CHARGE. Maj. C. W. Raymond.

Plans.

Approved Sept. 30, 1892, 93, 466.

FRANKFORD CREEK, BRIDGE STREET, PHILADELPHIA, PA. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 477.
ENGINEER IN CHARGE. Maj. C. W. Raymond.

Plans.

Reconstruction of bridge approved Jan. 7, 1895, 95, 477.

GALVESTON BAY, TEX., BETWEEN GALVESTON ISLAND AND VIRGINIA POINT. (Sp.)

(La Port, Houston & Northern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 475.
ENGINEER IN CHARGE. Maj. A. M. Miller.

bridge by act of Feb. 1, 1895, 95, 475.

Plans.

Approved Mar. 27, 1895; draw opening required to be 85 f. in the clear, 95, 475.

Legislation.

Company authorized to construct

GALVESTON BAY, TEX., BETWEEN GALVESTON ISLAND AND VIRGINIA POINT. (S.)

(Port Boliver, Galveston & Virginia Point Terminal R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 478.
ENGINEER IN CHARGE. Maj. A. M. Miller.

Plans.

Approved Mar. 25, 1895, 95, 478.

GASCONADE RIVER, MO. (A.)

(Missouri Pacific R. R. Co.)

Engineers.

ENGINEER IN CHARGE. Maj. A. M. Miller. Report, 88, 2559.

Maj. Miller reported that the drawspan should be made operative, and that a guide pier should be built above and below the pivot pier, 88, 2559.

Plans.

Description of the bridge, 88, 2559.

GASCONADE RIVER, ROLLINS FERRY, MO. (S.)

(Osage County bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **98**, 533.**Plans.**Modified plans approved Oct. 19, 1897, **98**, 533.**GAULEY RIVER, W, VA. (S.)**

(Chesapeake & Ohio R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **93**, 467.

ENGINEER IN CHARGE. Col. W. P. Craighill.

Plans.Approved Dec. 21, 1892, **93**, 467.**GAULEY RIVER, FAYETTE COUNTY, W. VA. (Sp., etc.)**

(Kanawha & Michigan (Ohio) Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **92**, 408.

ENGINEER IN CHARGE. Col. W. P. Craighill.

under act of Sept. 19, 1890, sec. 7, and act of West Virginia, **92**, 408.**Plans.**Modified plans approved Aug. 11, 1892, **92**, 408.**Legislation.**

Company authorized to construct bridge

GENESEE RIVER, CHARLOTTE, N. Y. (Sp.)**Engineers.**CHIEF OF ENGINEERS. Reports, **74**, 71, 583.BOARD OF ENGINEERS. Convened at Charlotte, N. Y., Aug. 26, 1873, approved location and plan, with certain modifications. Report, **74**, 584. Approved by Chief of Engineers, except regulations for government of operating draw, **74**, 583.Approved by Secretary of War, **74**, 584. Maj. Merrill, Wilson, and Harwood.**Legislation.**Bridge authorized by act of Mar. 3, 1873, **74**, 583.**Plans.**Submitted by Lake Ontario Shore R. R. Co., referred to Board of Engineers, **74**, 583.**GEORGIANA SLOUGH, WALNUT GROVE, CAL. (S.)**

(Sacramento County bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **1900**, 699.**Plans.**Approved Oct. 17, 1899, **1900**, 699.**GILPATRICKS COVE, NORTHEAST HARBOR, ME. (S.)**

(W. W. Vaughan.)

Engineers.CHIEF OF ENGINEERS. Report, **96**, 424.**Plans.**Approved Sept. 13, 1895, **96**, 424.**GRAND RIVER, OHIO. (S.)**

(Lake County bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **99**, 622.**Plans.**Plans for new bridge approved Apr. 14, 1899, **99**, 622.

GREAT KANAWHA RIVER, CHARLESTON, W. VA. (A.)

Commerce.

Requirements of commerce, **83**, 1593; **84**, 1804.

Engineers.

CHIEF OF ENGINEERS. Reports, **83**, 271, 1591; **84**, 271, 1796.

BOARD OF ENGINEERS. Recommend channel span with clear opening of 400 f. and its lowest part at least 29 f. above the highest water and 75 f. above l. w., **84**, 1798. (Lt. Cols. Craighill and Merrill and Capt. Post.)

Legislation.

Changes recommended by Board of Engineers, **84**, 1798, 1802.

Plans.

Col. W. P. Craighill reported that the channel span should not be less than 250 f. clear opening, height of clear spans not less than 70 f., **83**, 1592. Dimensions of spans referred to Board of Engineers. **84**, 1797.

Recommendations of Board, **84**, 1797.

GREAT KANAWHA RIVER, CHARLESTON, W. VA. (Sp.)

(Charleston & South Side Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **91**, 429.

BOARD OF ENGINEERS. Constituted by S. O. No. 28, May 31, 1890. (Col. W. P. Craighill, Maj. D. W. Lockwood, and Capt. E. Maguire.)

ENGINEER IN CHARGE. Col. W. P. Craighill.

Legislation.

Company authorized to construct

bridge under act of Mar. 3, 1887, **91**, 429.

Plans.

Revised plans conforming to the recommendation of the Board of Engineers approved Sept. 26, 1890. Apr. 20, 1891, Col. Craighill reported bridge completed as required, except that the main span was $\frac{1}{8}$ in. too low at Charleston end. **91**, 429.

GREAT KANAWHA RIVER, POINT PLEASANT, W. VA. (Sp.)

(Ohio River R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **88**, 308.

BOARD OF ENGINEERS. The Board of 1887 recommended location of bridge with a clear opening of 460 f., as proposed by the Ohio River R. R. Co., **88**, 2448.

(Col. Craighill, Lt. Col. Merrill, and Maj. Post.)

Legislation.

Act authorizing construction of bridge, Mar. 3, 1887, **88**, 2447.

GREAT PEDEE RIVER, 125 MILES ABOVE GEORGETOWN, S. C. (A.)

(Wilmington, Columbia & Augusta R. R. Co.)

Engineers.

ENGINEER IN CHARGE. Capt. W. H. Bixby. Report, **88**, 2547.

Plans.

Capt. Bixby recommended suitable

fenders at both ends of the draw openings of the bridge, extending 100 f. above and below the bridge, **88**, 2547.

GREAT PEDEE RIVER, NEAR SOCIETY HILL, S. C. (O.)

(Society Hill & Marlborough Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **92**, 411.

Plans.

Specified alterations required on or before Sept. 1, 1892, **92**, 411.

GREAT RIGOLETS, LA., BRIDGE (R. R.) ACROSS THE.**Engineers.**

CHIEF OF ENGINEERS. Report, 70, 63, 377.

ENGINEER IN CHARGE. Maj. C. B. Reese. Report, 70, 378.

Legislation.

Committee on Commerce (of U. S. Senate) requested, May 5, 1870, the views of Secretary of War, 70, 377.

Plans.

New Orleans, Mobile & Chattanooga R. R. Co.'s plan discussed, 70, 379. Objections to the bridge stated by Maj. Reese, 70, 379.

By Chief of Engineers, 70, 378. Suggestions for the improvement of the plan in interests of navigation, 70, 380.

GREEN RIVER (BELOW LOCK NO. 1) SPOTTSVILLE, KY. (O.)

(Louisville, St. Louis & Texas R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 434.

Plans.

Widening west draw opening to 160 f.

and placing west pier 52 f. west of position, to be completed on or before July 31, 1891; time extended to Oct. 31, 1891, 91, 434.

GUYANDOT RIVER. (See Ohio River, etc.)**GUYANDOT RIVER, W. VA. (S.)**

(Guyandot Valley Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 700.

Plans.

Plans for two bridges, 14½ miles and

20½ miles, respectively, above the mouth of the Guyandot, approved Mar. 24, 1900, 1900, 700.

GUYANDOT RIVER, SALT ROCK, W. VA. (S.)

(Cabel County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 533.

Plans.

Approved Nov. 1, 1897, 98, 533.

HACKENSACK RIVER, N. J. (S.)

(Pennsylvania R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 466.
ENGINEER IN CHARGE. Capt. T. L. Casey.

Plans.

Submitted Sept. 22, 1892, for replacing old with new bridge; approved Oct. 20, 1892, 98, 466.

HACKENSACK RIVER, N. J. (S.)

(Morris & Essex R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 701.

Plans.

Plans for new bridge approved May 21, 1900, 1900, 701.

HACKENSACK RIVER, HACKENSACK, N. J. (S.)

(Bergen County Traction Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 700.

Plans.

Approved Jan. 4, 1900, 1900, 700.

HACKENSACK RIVER, ANDERSON STREET, HACKENSACK, N. J. (S.)

(Bergen County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 534.

Plans.

Reconstruction plans approved Mar. 14, 1898, 98, 534.

HARLEM RIVER, NEW YORK CITY. (A.)

Commerce.

Commercial interest involved, 90, 3486.

Engineers.

CHIEF OF ENGINEERS. Report, 90, 344.

BOARD OF ENGINEERS. Convened at New York City, June 19, 1890, by S. O. No. 25, to report upon alleged obstruction of navigation by certain bridges over the

Harlem River. The Board recommended increasing the clear headway of the Third and Fourth avenue bridges to 24 f. above h. w. level, 90, 3487. (Cols. Abbot and Comstock and Lt. Col. Gillespie.)

Legislation.

Notice served as to alterations required, 90, 344.

HARLEM RIVER, BROADWAY CROSSING, N. Y. (S.)

(New York City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 467.

ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.

Legislation.

Congress, act of Sept. 19, 1890, required submission of plans, 93, 467.

Plans.

Submitted Apr. 28, 1892; modified plans Jan. 31, 1893; approved Feb. 11, 1893, 93, 467.

HARLEM RIVER, BROADWAY EXTENDED, NEW YORK CITY, N. Y. (Sp., etc.)

(Hugh N. Camp and D. E. Seybel.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 406.

ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.

Plans.

Permission to build temporary foot bridge granted June 24, 1892, by revocable license, 92, 406.

HARLEM RIVER, FIRST AVENUE, NEW YORK, N. Y. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 477.

ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.

Plans.

Approved Jan. 11, 1895, 95, 477.

HARLEM RIVER, FOURTH AVENUE, NEW YORK, N. Y. (Sp., etc.)

(New York Central & Hudson River R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 406.

ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.

Legislation.

Company authorized to construct bridge under act of Sept. 19, 1890, and act of New York, 92, 406.

Plans.

Reconstruction plans for a temporary bridge, approved May 27, 1892, and for a permanent bridge, approved Aug. 5, 1892, 92, 406.

**HARLEM RIVER, BETWEEN 145TH AND 149TH STREETS,
N. Y. (S.)**

(New York City bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **98**, 533.**Plans.**Approved Nov. 11, 1897, **98**, 533.**HARLEM RIVER, 156TH STREET, AND McCOMB DAM
ROAD, N. Y. (Sp.)**

(New York City Commissioners of Public Parks.)

Engineers.CHIEF OF ENGINEERS. Report, **91**, 433.

ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.

bridge under act of Sept. 19, 1890, sec. 7, and act of New York, **91**, 433.**Plans.**Plans to replace the McComb Dam bridge approved, Sept. 7, 1891, **91**, 433.**Legislation.**

Commissioners authorized to construct

**HARLEM RIVER, 156TH STREET, NEW YORK CITY,
N. Y. (O.)**

(City bridge.)

Engineers.CHIEF OF ENGINEERS. Reports, **92**, 406; **97**, 536.

ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.

This temporary bridge to be removed upon completion of permanent bridge at 155th street. **92**, 406.Bridge, at 155th street, completed; notice served, Apr. 13, 1897, requiring removal of temporary bridge at 156th street within 90 days, **97**, 536.**Plans.**

Permission for temporary bridge granted by revocable license, July 5, 1892.

HARLEM RIVER, THIRD AVENUE, NEW YORK, N. Y. (S.)

(City bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **93**, 469.

ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.

Plans.Bridge obstructed navigation. City notified, July 2, 1890, to alter it; alteration plans approved, Mar. 24, 1893. **93**, 469.**HILLEBRANDT BAYOU, TEX. (S.)**

(Jefferson County bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **97**, 533.**Plans.**Approved Mar. 30, 1897, **97**, 533.**HILLSBOROUGH RIVER, TAMPA, FLA. (S.)**

(Savannah, Florida & Western Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **94**, 426.

ENGINEER IN CHARGE. Lt. A. M. D'Armit.

Plans.Approved Oct. 23, 1893, **94**, 426.**HILLSBORO RIVER, TAMPA, FLA. (S.)**

(City bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **95**, 479.

ENGINEER IN CHARGE. Maj. T. H. Handbury.

Plans.Plans for rebuilding bridge approved June 22, 1895, **95**, 479.

HOLSTON RIVER (Boyd's Ferry), NEAR KNOXVILLE, TENN.
(Knoxville County bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 93, 470; 94, 427.

ENGINEER IN CHARGE. Capt. J. Biddle.

Plans.

Approved Aug. 2, 1893, 93, 470. Modified plan approved Nov. 29, 1893. 94, 427.

HOQUIAM RIVER, WASH. (S.)

(United railroads of Washington.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 533.

Plans.

Approved Oct. 2, 1897, 98, 533.

HOQUIAM RIVER, HOQUIAM, WASH. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 700.

Plans.

Plans approved Dec. 19, 1899, 1900, 700.

HOUSATONIC RIVER. (See Coscob, etc.)

HOUSATONIC RIVER, STRATFORD, CONN. (A.)

(Highway.)

Engineers.

ENGINEER IN CHARGE. Lt. Col. D. C. Houston. Report, 88, 2611.

Lt. Col. Houston recommended that the fifth and sixth spans be made draw spans, 88, 2612.

Plans.

Description, 88, 2612.

HOUSATONIC RIVER, BETWEEN STRATFORD AND MILFORD, CONN. (O.)

(Washington Bridge, Fairfield and New Haven counties.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 474.

before Dec. 1, 1893. Board of Commissioners decided to build new bridge. 93, 474.

Plans.

Specified alterations required on or

HOUSTON RIVER, CALCASIEU PARISH, LA. (S.)

(Kansas City, Shreveport & Gulf Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 699.

Plans.

Plans for new bridge approved Oct. 18, 1899, 1900, 699.

HUDSON RIVER AT NEW YORK CITY. (Sp.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 433. BOARD OF ENGINEERS. Convened to consider and report upon plan of bridge, 91, 3853. The board recommended that the clear headway at the middle of the span above h. w. of spring tides be in-

creased in the plans to not less than 150 f., 91, 3859. (Cols. Abbot, Comstock, and Houston, and Lt. Col. Gillespie.)

Legislation.

Bridge authorized by act of July 11, 1890; requirements of the act, 91, 3853.

HUDSON RIVER, NEW YORK CITY, N. Y. (Sp.)

(New York & New Jersey Bridge Co.'s.)

Engineers.CHIEF OF ENGINEERS. Reports, **96**, 423; **99**, 619.**Legislation.**Companies authorized to construct bridge by act of June 7, 1894, **96**, 423.**Plans.**

Plans submitted June 4, 1895; approved,

without date, contingent upon report of board of harbor lines, 1896, which recommended, Feb. 28, 1896, revised plans of approaches and map of location; approved Mar. 13, 1896, **96**, 423. Detailed plans submitted Mar. 10, 1897; approved May 24, 1899, **99**, 619.**HUDSON RIVER, NEAR TWENTY-THIRD STREET, NEW YORK CITY, N. Y. (Sp., etc.)**

(North River Bridge Co.)

Engineers.CHIEF OF ENGINEERS. Report, **92**, 403.
ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie.**Plans.**Modified plans, conforming to the requirements as to height fixed by the War Department, approved Dec. 29, 1891, **92**, 403.**HUNTING CREEK, ALEXANDRIA, VA. (Sp., etc.)**

(Washington, Alexandria & Mount Vernon Electric Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **92**, 409.
ENGINEER IN CHARGE. Maj. C. E. L. B. Davis.**Legislation.**Company authorized to construct bridge under act of July 13, 1892, sec. 3, and act of Virginia, **92**, 409.**Plans.**Approved Aug. 20, 1892, on condition that the width of draw opening be increased to 40 f. when so desired by the Secretary of War, **92**, 409.**HURON RIVER, HURON, OHIO. (Sp., etc.)**

(Lake Shore & Michigan Southern Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **92**, 402.
ENGINEER IN CHARGE. Lt. Col. J. A. Smith.**Legislation.**

Company authorized to construct

bridge under act of Sept. 19, 1890, sec. 7, and act of Ohio, **92**, 402.**Plans.**Approved Dec. 18, 1891, **92**, 402.**ILLINOIS RIVER. (See Ohio River.)****ILLINOIS RIVER, BETWEEN COLUMBIANA AND KAMPSVILLE, ILL. (Sp., etc.)**

(Litchfield, Carrollton & Western R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Reports, **92**, 401; **93**, 465.

ENGINEER IN CHARGE. Capt. W. L. Marshall.

Legislation.

Company authorized to construct bridge

by act of March 3, 1883; amending act, Oct. 1, 1890, **92**, 401.**Plans.**Modified plan approved Nov. 4, 1891, and May 9, 1893, **92**, 401; **93**, 465.

ILLINOIS RIVER, HAVANA, ILL. (Sp., etc.)

(Chicago, Peoria & St. Louis Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 409.
ENGINEER IN CHARGE. Capt. W. L. Marshall.

Legislation.

Company authorized to construct bridge by act of June 6, 1892, 92, 409.

Plans.

Approved Aug. 27, 1892, 92, 409.

ILLINOIS RIVER, NEAR MARQUETTE, ILL. (S.)

(Streator & Clinton R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Approved Aug. 11, 1899, 99, 623.

ILLINOIS RIVER, PEKIN, ILL. (S.)

(Peoria & Pekin Traction Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 534.

Plans.

Modified plans approved Feb. 8, 1898, 98, 534.

INLAND WATERWAY. (See *Christiana River, Wilmington, Del., etc.*)

JAMAICA BAY, BEACH CHANNEL, ROCKAWAY BEACH, N. Y. (S.)

(Brooklyn & Jamaica Bay Turnpike Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 621.

Plans.

Approved Dec. 21, 1898, 99, 621.

JAMES RIVER, RICHMOND, VA. (S.)

(Richmond, Petersburg & Carolina R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Approved July 28, 1899, 99, 623.

JOHN DAYS RIVER, OREG. (S.)

(Astoria & Columbia River R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 425.

Plans.

Approved Nov. 18, 1895, 96, 425.

JOHNS RIVER. (See *Chehalis River.*)

JUPITER RIVER, FLA. (S.)

(Jacksonville, St. Augustine & Indian River Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 471.
ENGINEER IN CHARGE. Lt. A. M. D'Armit.

Plans.

Approved Aug. 15, 1893, 93, 471.

KABEKONA NARROWS, MINN. (S.)

(St. Paul, Minneapolis & Manitoba Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 534.

Plans.

Approved March 14, 1898, 98, 534.

KALAMAZOO RIVER, NEW RICHMOND, MICH. (A and O.)

(Chicago & West Michigan Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Reports, **99**, 624; **1900**, 702.**Plans.**

Approved June 13, 1899, for a 40-f. draw over main channel before Aug. 26, 1899. On July 31, 1899, previous action

modified, at option of company, as specified, **99**, 624. Company failed to alter bridge within time specified. Alteration plans as required by the Department accepted March 13, 1900, as satisfactory. Time extended to July 15, 1902. **1900**, 702.**KAWKAWLIN RIVER, BAY COUNTY, MICH. (S.)**

(Detroit & Mackinac Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **96**, 427.**Plans.**Approved June 29, 1896, **96**, 427.**KANAWHA RIVER. (See Ohio River.)****KENNEBEC RIVER. (See Atkins Bay.)****KENTUCKY RIVER, KY. (A.)****Engineers.**CHIEF OF ENGINEERS. Report, **90**, 342.ENGINEER IN CHARGE: Capt. J. C. Post. Report, **88**, 2574.**Legislation.**Notice served as to alterations required, **90**, 342.**Plans.**Location and dimensions of bridges crossing the improved portion of the Kentucky River, **88**, 2574.Bridge at Worthville and two at Frankfort restrict navigation, and Capt. Post recommended that they be raised or rebuilt, **88**, 2575, 2576.**KENTUCKY RIVER, KY. (S.)**

(City of Frankfort and county of Franklin bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **93**, 473.

ENGINEER IN CHARGE. Maj. D. W. Lockwood.

Plans.

Under act of Sept. 19, 1890, raising of

the bridge to 48 f. 4 in. above normal pool level ordered Sept. 8, 1891, **92**, 411. Plans for elevating bridge 43 f. 4 in., approved May 22, 1893. **93**, 473.**KENTUCKY RIVER, CARROLLTON, KY. (S.)**

(Carrollton Electric Ry. & Bridge Co.)

Engineers.CHIEF OF ENGINEERS. Report, **1900**, 699.**Plans.**Approved Nov. 10, 1899, **1900**, 699.**KENTUCKY RIVER, FRANKFORT, KY. (O.)**

(Louisville & Nashville R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **89**, 376.**Plans.**Alterations required by Jan. 1, 1890; time extended to Jan. 9, 1891, **89**, 376.

KENTUCKY RIVER, FRANKFORT, KY. (O.)

(Louisville & Nashville R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 91, 436; 93, 471.

ENGINEER IN CHARGE. Maj. D. W. Lockwood, 1893.

Plans.

Required to raise bridge 10 f. on or before Sept. 1, 1892, 91, 436. Plans for raising bridge 43 f. 4 in. in all, required under act of Sept. 19, 1890; approved Oct. 24, 1892. 93, 471.

KENTUCKY RIVER, ST. CLAIR STREET, FRANKFORT, KY. (O.)

(Frankfort County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 411.

Plans.

Specified alterations to be made on or before Sept. 1, 1892, 92, 411.

KENTUCKY RIVER, ST. CLAIR STREET, FRANKFORT, KY. (O.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 376.

Plans.

Alterations required by Jan. 1, 1890; time extended to Jan. 1, 1891, 89, 376.

KENTUCKY RIVER, NEAR TYRONE, KY. (Sp.)

(Louisville Southern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 371.

ENGINEER IN CHARGE. Maj. D. W. Lockwood.

Legislation.

Company authorized to construct bridge by act of Oct. 9, 1888, 89, 371.

Plans.

Approved Mar. 30, 1889, 89, 371.

KENTUCKY RIVER, WORTHVILLE, KY. (O.)

(Louisville & Nashville R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 376.

Plans.

Alterations required by Jan. 1, 1890; time extended to Jan. 9, 1891, 89, 376.

KENTUCKY RIVER, NORTH FORK, MOUTH OF WALKERS CREEK, KY. (Sp.)

(Kentucky Union Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 372.

ENGINEER IN CHARGE. Maj. D. W. Lockwood.

Legislation.

Company authorized to construct bridge by act of Mar. 1, 1889, 89, 372.

Plans.

Approved June 19, 1889, 89, 372.

KENTUCKY RIVER, NORTH FORK. (S.)

(Ohio & Kentucky Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 699.

Plans.

Approved Oct. 27, 1899, 1900, 699.

KEWAUNEE RIVER, KEWAUNEE, WIS. (Sp., etc.)

(Kewaunee, Green Bay & Western R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 410.

ENGINEER IN CHARGE. Maj. J. F. Gregory.

Legislation.

Company authorized to construct bridge

under act of July 13, 1892, and act of Wisconsin, 92, 410.

Plans.

Approved Sept. 6, 1892, 92, 410.

KEWAUNEE RIVER, PARK STREET, KEWAUNEE, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 466.

ENGINEER IN CHARGE. Maj. J. F. Gregory.

Plans.

Submitted July 2, 1892, for replacing old with new bridge; approved Oct. 14, 1892, 93, 466.

KINGSLEYS CREEK, FLA. (O.)

(County bridge.)

Engineers.

ENGINEER IN CHARGE. Lt. O. M. Carter, 1889, 89, 2797.

Plans.

The narrow opening of the county bridge, near the railroad bridge, dangerous to steamboats, 89, 2797.

KINGSLEYS CREEK, A PART OF THE INLAND COMMUNICATION BETWEEN SAVANNAH, GA., AND JACKSONVILLE, FLA. (O.)

(Florida Ry. & Navigation Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 377.

Plans.

Alterations required by Apr. 15, 1889;

time extended to May 1, 1889. Bridge provided with a 56.7-f. drawspan, which is sufficient. 89, 377.

KINNICKINIC RIVER, MILWAUKEE, WIS. (S.)

(Chicago & Northwestern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 533.

Plans.

Reconstruction plans and plans for a

temporary bridge approved Jan. 13, 1897, 97, 533.

KINNICKINIC RIVER, CLINTON STREET, MILWAUKEE, WIS. (S., Sp., etc.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 92, 410; 93, 470.

ENGINEER IN CHARGE. Maj. J. F. Gregory.

Legislation.

City authorized to construct bridge un-

der act of July 13, 1892, sec. 3, and act of Wisconsin, 92, 410.

Plans.

Plan for new bridge approved Sept. 12, 1892, 93, 410. Modified plans approved July 29, 1893, 93, 470.

KINNICKINIC RIVER, LINCOLN AVENUE, MILWAUKEE, WIS. (S.)
(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 99, 621; 1900, 699.

Plans.

Plans for temporary bridge, for use pending reconstruction of existing bridge,

approved Nov. 1, 1898. Modified plans, change in location to permit construction of bridge at Lincoln avenue, approved Dec. 31, 1898. 99, 621. Reconstruction plans approved Sept. 21, 1899, 1900, 699.

LAFOURCHE BAYOU, LA. (S.)

(Morgan's Louisiana & Texas R. R. and Steamship Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Reconstruction plans approved July 29, 1899, 99, 623.

LAFOURCHE BAYOU, LABADIEVILLE, LA. (S.)

(Labadieville Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 470.
ENGINEER IN CHARGE. Maj. J. B. Quinn.

Plans.

Approved June 2, 1893, 98, 470.

LAFOURCHE BAYOU, LOCKPORT, LA. (S.)

(Lockport Bridge Stock Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Approved June 30, 1899, 99, 623.

LAFOURCHE BAYOU, NAPOLEONVILLE, LA. (S.)

(Napoleonville Bridge Stock Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 470.

Plans.

Approved June 5, 1893, 98, 470.

LAKE CHAMPLAIN, BETWEEN COLCHESTER AND SOUTH HERO, VT.; GRAND ISLE AND NORTH HERO, VT.; AND NORTH HERO AND ALBANY, VT. (Sp.)

(Rutland-Canadian R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 619.

bridges by act of Feb. 4, 1899, 99, 619.

Legislation.

Company authorized to construct these

Plans.

Approved March 16, 1899, 99, 619.

LAKE CHAMPLAIN, BETWEEN NORTH HERO AND ALBURN. (Sp.)

Engineers.

CHIEF OF ENGINEERS. Report, 88, 398, 2432.

Plans.

Maj. Adams reported bridge not an obstruction to navigation, 88, 2432-2433.

Legislation.

Bridge authorized by act of June 20, 1884, 88, 2431.

LAKE CHAMPLAIN, ROUSE'S POINT, N. Y. (Sp.)

Legislation.

Bridge authorized by act of Feb. 24, 1883, 83, 271.

Plans.

The Chief of Engineers recommended that the plans and location of the bridge be approved, 83, 1611.

**LAKE CHAMPLAIN, AT ROUSE POINT, BETWEEN ALBURG,
VT. AND CHAMPLAIN, N. Y. (Sp.)**

(Rutland-Canadian R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 697.

Legislation.

Company authorized to construct bridge by act of Feb. 4, 1899, 1900, 697.

Plans.

Approved Feb. 10, 1900, 1900, 697.

LAKE CHAMPLAIN CHANNEL, NORTH HERO, VT. (Sp.)**Engineers.**

CHIEF OF ENGINEERS. Report, 90, 336.

Legislation.

Authorized by act of Oct. 12, 1888, 90, 336.

Plans.

Plans submitted and approved July 2, 1889, 90, 336.

LAKE CHARLES, GA. (See Calcasieu River.)**LAKE ERIE. (See Detroit, Mich.)****LAKE HURON. (See Detroit, Mich.)****LAKE ST. CROIX, HUDSON CITY, WIS. (Sp.) (A.)**

(Railway.)

Engineers.

ENGINEER IN CHARGE. Maj. C. J. Allen. Report, 88, 2637.

Legislation.

Bridge authorized by act of May 15, 1872, 78, 1091.

Plans.

Maj. Allen reported that sheer booms should be placed to assist vessels in passing the spans, 88, 2637.

LAZARETTO CREEK, GA. (A.)

(Savannah & Tybee R. R. Co.)

Engineers.

ENGINEER IN CHARGE. Lt. O. M. Carter, 1889. Report, 89, 2796.

Plans.

Very little commerce; difficult to pass

through the draw without striking the piers, 89, 2796.

LEWIS CREEK, LEWIS, DEL. (S.)

(Queen Anne R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Approved Mar. 30, 1898, 98, 535.

LEWIS RIVER, EAST FORK, LA CENTER, WASHINGTON. (S.)

(Clark County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 428.

ENGINEER IN CHARGE. Maj. J. C. Post.

Plans.

Approved Apr. 11, 1894, 94, 428.

LEWIS AND CLARK RIVERS, OREG. (S.)

(Clatsop County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 426.

Plans.

Approved Mar. 30, 1896, 96, 426.

LICKING RIVER, BETWEEN NEWPORT AND COVINGTON, KY. (Sp., etc.)

(Kenton and Campbell counties' bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 404.

ENGINEER IN CHARGE. Maj. A. Stickney.

Legislation.

Counties authorized to construct bridge under act of Sept. 19, 1890, sec. 7, and act of Kentucky, 92, 404.

Plans.

Approved Apr. 20, 1892. Plans for false work, to be erected during construction, approved Aug. 10, 1892; false work and all obstructions to be removed by Oct. 1, 1892. 92, 404.

LITTLE CALUMET RIVER, NEAR CHICAGO, ILL. (S.)

(Michigan Central R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 536.

Plans.

Reconstruction plans approved June 16, 1898.

LITTLE CALUMET RIVER, NEAR CHICAGO, ILL. (S.)

(Calumet Western Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.

Approved May 2, 1899, 99, 622.

LITTLE CHUTE, GOVERNMENT CANAL AT LOCK, WIS. (S.)

(Kaukauna bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 429.

ENGINEER IN CHARGE. Maj. J. F. Gregory.

Plans.

Approved June 22, 1894, 94, 429.

LITTLE ISLAND, CHANNEL SEPARATING IT FROM MAINLAND AT OSTERVILLE, IN TOWN OF BARNSTABLE, MASS. (Sp.)

(Messrs. F. W. Dickinson, R. M. Winfield, F. P. Foster, and J. H. Murphy.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 431.

ENGINEER IN CHARGE. Maj. W. R. Livermore.

under act of Sept. 19, 1890, sec. 7, and act of Massachusetts, 91, 431.

Plans.

Approved May 19, 1891, 91, 431.

Legislation.

Owners authorized to construct bridge

LITTLE KANAWHA RIVER. (See Ohio River, etc.)

LITTLE KANAWHA RIVER, PARKERSBURG, W. VA. (A.)

Engineers.

ENGINEER IN CHARGE. Maj. J. C. Post. Report, 88, 2649.

Plans.

The bridge destroys a former landing of Ohio River steamers, and prevents the use of the mouth of the river as an ice harbor, 88, 2649.

LITTLE KANAWHA RIVER, PARKERSBURG, W. VA. (A.)

(County.)

Engineers.

ENGINEER IN CHARGE. Capt. J. C. Post. Report, 88, 2577.

Plans.

Description, 88, 2577. Capt. Post recommended that it be converted into a drawbridge by building a middle pier, 88, 2577.

LITTLE RIVER, LA. (Sp.)

(Houston, Central Arkansas & Northern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 429.
ENGINEER IN CHARGE. Capt. J. H. Willard.

Legislation.

Company authorized to construct bridge by act of Aug. 6, 1888; amending act, Aug. 18, 1890, 91, 429.

Plans.

Approved Nov. 5, 1890. Navigation interests require a drawbridge; new plans for same approved June 15, 1891. 91, 429.

LITTLE RIVER, NEAR MORRIS FERRY, ARK. (Sp.)

(Texarkana & Fort Smith Ry Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 475.
ENGINEER IN CHARGE. Capt. J. H. Willard.

Legislation.

Company authorized to construct bridge

by act of Apr. 21, 1894, amending act Jan. 19, 1896, 95, 475.

Plans.

Approved Mar. 27, 1895, on certain conditions respecting height above water, 95, 475.

LITTLE RIVER, PERRY, WASHINGTON COUNTY, ME. (O.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 427.

Plans.

Alterations required: A draw with 16 f. width of opening in the channel span

of the bridge to be completed within three months from Oct. 15, 1895; time extended frequently, last extension being to Sept. 1, 1896, 96, 427.

LITTLE WABASH RIVER, NEW HAVEN, ILL. (S.)

(Gallatin and White counties' bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 477.
ENGINEER IN CHARGE. Capt. J. G. Warren.

Plans.

Approved Nov. 9, 1894; modified plans approved Feb. 23, 1895. Bridge completed. 95, 477.

LOGGY BAYOU, LA. (Sp.)

(Shreveport & Red River Valley Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 619.

Legislation.

Company authorized to construct bridge by act of Apr. 11, 1898, 99, 619.

Plans.

Approved Apr. 12, 1899. Temporary bridge for use during construction of permanent bridge was authorized to be built at this place. 99, 619.

LONG BEACH CHANNEL, FROM BARNUM ISLAND TO INNER BEACH, N. Y. (S.)

(Hempstead City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 533.

Plans.

Approved Dec. 24, 1896, 97, 533.

LONG TOM RIVER, BUNDYS, OREG. (S.)

(Benton County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 701.

Plans.

Approved Feb. 2, 1900. Bridge proving unsatisfactory, new plans approved June 26, 1900. 1900, 701.

LOUISVILLE AND PORTLAND CANAL. (*See Ohio River.*)

LUMBER RIVER, N. C. (O.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 343.

Legislation.

Notices served as to alterations required, 90, 343.

LUMBER RIVER, N. C. (S.)

(Wilmington, Columbia & Augusta R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 467.
ENGINEER IN CHARGE. Capt. F. V. Abbot.

Plans.

Approved Jan. 26, 1893, 93, 467.

LUMBER RIVER, NEAR FAIRBLUFF, N. C. (S.)

(Butters Lumber Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 536.

Plans.

Approved June 8, 1898, 98, 536.

LUMBER RIVER, FAIR BLUFF; PRINCESS ANN; IVEY, BLUFF; PHILLIPS, AND MATTHEWS BLUFF, N. C. (O.)

(Owned jointly by Robeson and Columbus counties.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 377.

Plans.

Alterations required by May 7, 1890, 89, 378.

LUMBER RIVER, N. C. (A.)

(Carolina Central R. R. bridges below Lumberton; W. & C. R. R. bridges, S. C., above river's mouth, and a bridge at Nicholas.)

Engineers.

ENGINEER IN CHARGE. Capt. F. V. Abbot, 1889. Report, 89, 2795.

Plans.

Should be provided with draw openings, 89, 2795.

MABSCO CREEK. (*See Pamunkey River.*)

MANASQUAN RIVER, BETWEEN MANASQUAN AND POINT PLEASANT, N. J. (S.)

(Monmouth and Ocean counties' bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 532.

Plans.

Reconstruction plans approved Nov. 9, 1896, 97, 532.

MANISTEE RIVER, SMITH STREET, MANISTEE, MICH. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 427.
ENGINEERS IN CHARGE:
Maj. W. Ludlow.
Lt. Col. J. J. Lydecker.

Plans.

Approved Sept. 27, 1893; modification approved Jan. 18, 1894, 94, 427.

MANITOWOC RIVER, MANITOWOC, WIS. (S.)

(Chicago & Northwestern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.

Approved Feb. 28, 1899, 99, 622.

MANITOWOC RIVER, FOOT OF 8TH STREET, MANITOWOC, WIS. (Sp., etc.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **92**, 404.
ENGINEER IN CHARGE. Maj. J. F. Gregory.

Legislation.

City authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Wisconsin, **92**, 404.**Plans.**Plan for new bridge approved Mar. 8, 1892, **92**, 404.**MANITOWOC RIVER, NEAR HIGH STREET, MANITOWOC, WIS. (S.)**

(Manitowoc Terminal Co.)

Engineers.CHIEF OF ENGINEERS. Report, **96**, 426.**Plans.**Approved Jan. 18, 1896, **96**, 426.**MANITOWOC RIVER, MAIN STREET, MANITOWOC, WIS. (S.)**

(City bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **97**, 534.**Plans.**Reconstruction plans approved June 16, 1897, **97**, 534.**MANITOWOC RIVER, MANITOWOC, WIS. (S.)**

(Manitowoc Terminal Co., 2 bridges.)

Engineers.

CHIEF OF ENGINEERS. Reports, **95**, 480; **96**, 425, 426.
ENGINEER IN CHARGE. Capt. C. F. Palfrey, 1895.

at 8th street, approved Aug. 2, 1892, **95**, 480. Modified plans for first crossing, providing for a fixed span with a lift draw, approved Jan 18, 1896, **96**, 425, 426.

Plans.

Plans for bridges at Main street, and

MANTUA CREEK. (See Schuylkill River.)**MATANZAS RIVER, ST. AUGUSTINE, FLA. (S.)**

(St. Augustine Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **95**, 479.
ENGINEER IN CHARGE. Maj. T. H. Handbury.

Plans.Approved June 10, 1895, **95**, 479.**MATTAPONI RIVER, WALKERTON, VA. (S.)**

(Walkerton & Mattaponi Bridge Co.)

Engineers.CHIEF OF ENGINEERS. Report, **99**, 621.**Plans.**Approved Oct. 28, 1898, **99**, 621.**MAUMEE RIVER, TOLEDO, OHIO. (S.)**

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, **95**, 478; **96**, 425.
ENGINEER IN CHARGE. Lt. Col. J. A. Smith, 1895.

Plans.

Plans submitted Feb. 4, 1895, modified Mar. 25, 1895; approved Apr. 12, 1895, **95**, 478. Modified plans approved Nov. 16, 1895, **96**, 425.

MAUMEE RIVER, TOLEDO, OHIO. (S.)

(Lake Shore & Michigan Southern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 699.

Plans.

Plans for new bridge approved Sept. 27, 1899, 1900, 699.

McGIRTS CREEK, DUVAL COUNTY, FLA. (S.)

(Jacksonville, Tampa & Key West Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 470.
ENGINEER IN CHARGE. Lt. A. M. D'Armit.

Plans.

Reconstruction plans approved Aug. 15, 1893, 93, 470.

MENOMONEE RIVER, WIS. (Sp.)

(Menomonee, Michigan & Mariette cities' bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 369.
ENGINEER IN CHARGE. Maj. C. E. L. B. Davis.

to construct bridge by act of July 29, 1886, 89, 369.

Plans.

Approved Sept. 10, 1888; reported completed, 89, 369.

Legislation.

Municipalities of the 3 cities authorized

MERRIMAC RIVER, BETWEEN HAVERHILL AND BRADFORD, MASS. (O.)

(Cities' bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 430.

Plans.

Specified alterations required on or before Oct. 1, 1894, 94, 430.

MICHIGAN CITY, IND., INNER HARBOR. (A.)

(Michigan Central Ry. bridge.)

Engineers.

ENGINEER IN CHARGE. Maj. W. Ludlow, 1889. Report, 89, 2802.

Plans.

Draw opening too narrow, and swinging by hand very laborious, 89, 2803.

MIDDLE RIVER, CAL. (S.)

(San Francisco & San Joaquin Valley R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 621.

Plans.

Approved Oct. 28, 1898, 99, 621.

MILL CREEK, FORT MONROE, VA. (Sp.)

(Iron pile bridge.)

Appropriations.

1889, \$20,000, 89, 466.

ENGINEER IN CHARGE. Lt. Col. P. C. Hains, 1889-90. Reports, 89, 465; 90, 387.

Contracts.

1889. Groton Bridge & Mfg. Co., bridge, \$17,500, 90, 387.

Operations.

1889-90. Construction of bridge under contract completed, 90, 387.

Engineers.

CHIEF OF ENGINEERS. Reports, 89, 12; 90, 9.

Plans.

Description of proposed structure, 89, 466.

MILL CREEK, THOMASTON, ME. (S.)

(Maine Central R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.

Approved Feb. 6, 1899, 99, 622.

MILL NECK CREEK INLET, FROM ALLENS POINT TO PINE ISLAND AT BAYVILLE, N. Y. (S.)

(Oyster Bay bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 533.

Plans.

Approved Jan. 5, 1897, 97, 533.

MILL RIVER, CHAPEL STREET, NEW HAVEN, CONN. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 534.

Plans.

Approved Apr. 29, 1897, 97, 534.

MILWAUKEE RIVER, MILWAUKEE, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 469.

ENGINEER IN CHARGE. Maj. J. F. Gregory.

Plans.

Approved Apr. 14, 1893, 98, 469.

MILWAUKEE RIVER, MILWAUKEE, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 96, 426, 99, 621.

Plans.

Reconstruction plans for bridge at Hu-

ron street, approved Feb. 25, 1896, 96, 426. Modified plans providing for a row of fender piling along each abutment, approved Nov. 1, 1898, 99, 426.

MILWAUKEE RIVER, BROADWAY, MILWAUKEE, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 699.

Plans.

Reconstruction plans, approved Sept. 21, 1899, 1900, 699.

MILWAUKEE RIVER, CONNECTING GRAND AVENUE AND WISCONSIN STREET, MILWAUKEE, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 701.

Plans.

Reconstruction plans approved June 5, 1900, 1900, 701.

MISSISQUOI BAY, ALBURG POINT, VT. (S.)

(Vermont & Providence Line R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 535.

Plans.

Modified plans approved Aug. 20, 1897, 97, 535.

MISSISQUOI BAY, VT. (A. and O.)

(Lamoille Valley Extension R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 343.
ENGINEER IN CHARGE. Maj. M. B. Adams. Report, 88, 2652.

Legislation.

Notice served as to alteration required, 90, 344.

Plans.

Maj. Adams recommended the removal of the bridge, it being no longer in use and being a great obstruction on account of the narrowness of the draw, 88, 2652.

MISSISSIPPI RIVER. (See Ohio River.)

MISSISSIPPI RIVER, BRIDGES OVER.

Engineers.

ENGINEER IN CHARGE.
Maj. G. K. Warren, 1870-79. Reports, 70, 58; (Lt. Col.) 79, 1462:
Maximum grade and curvature of the following bridges, 79, 1462:
St. Paul highway.
St. Paul railway.
Hastings railway.
Winona railway (2).

La Crosse railway.
Prairie du Chien railway (pontoon).
Dubuque railway.
Clinton railway.
Rock Island rail and high way.
Keokuk rail and high way.
Quincy railway.
Hannibal rail and high way.
Louisiana railway.

MISSISSIPPI RIVER. (O.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 338.

Legislation.

Act of Aug. 11, 1888, providing for

alteration of structures impeding navigation, 90, 338.

Notice served upon various bridge owners, requiring alterations, 90, 339.

MISSISSIPPI RIVER, AITKIN, MINN. (Sp.)

(Aitkin County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 423.

Legislation.

Company authorized to construct bridge by act of Mar. 23, 1896, 96, 423.

Plans.

Plans submitted Dec. 2, 1895, and Jan. 30, 1896; approved May 9, 1896, 96, 423.

MISSISSIPPI RIVER, ALTON, ILL. (Sp.)

(St. Clair, Madison & St. Louis Belt R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 432.
ENGINEER IN CHARGE. Maj. A. M. Miller.

Legislation.

Company authorized to construct bridge by act of Aug. 29, 1890, 91, 432.

Plans.

Approved Aug. 1, 1891, on certain conditions, 91, 432.

MISSISSIPPI RIVER, BURLINGTON, IOWA. (Sp.)

(Railway.)

Commerce.

Influence of bridge upon navigation, **78, 1004.**

Engineers.

CHIEF OF ENGINEERS. Report **77, 96.** Approved recommendation of board, **77, 817.**

BOARD OF ENGINEERS. Convened at St. Louis, Mo., July 17, 1876, to inquire into the expediency of placing sheer-booms on the upper end of all or any bridge pier on the Mississippi River. Adjourned to await the completion of maps. **77, 821.** Reconvened January 26, 1877. Recommend a sheer-boom 500 f. in length at this bridge. Report, **77, 819, 824.** (Cols. Macomb and Simpson, Majs. War-

ren, Farquhar, and Suter, and Capt. Allen.)

Legislation.

Bridge authorized by act of July 25, 1866, **77, 824; 78, 1003.** Various acts relating to the bridge, **78, 1089.**

Plans.

Dimensions of bridge, **77, 824; 78, 1003.** Description of plans by Maj. Warren, **78, 1003.** High bridge would be very expensive, **78, 1006.** Changes in bridge proposed by Maj. Warren, **78, 1006.**

Surveys.

MAPS. Diagram of piers, **78, 1004.** Maps of locality of bridge, Nos. 21 and 22, **78, 1126.**

MISSISSIPPI RIVER, CLINTON, IOWA. (Sp.)

(Pontoon.)

Engineers.

CHIEF OF ENGINEERS. Reports, **75, 121.** Approves conclusions of Board of Engineers, **75, ii, 682.** Approved by Secretary of War, **75, ii, 683.**

BOARD OF ENGINEERS. Convened at Clinton, Iowa, October 8, 1874. Recommendations of. **75, ii, 683.** Report, **75, ii, 683.** (Col. Macomb, Majs. Weitzel, and Farquhar.)

Legislation.

Bridge authorized by act of Apr. 1, 1872, and June 6, 1874, **75, ii, 682.** Various acts relating to the bridge, **78, 1093.**

Plans.

By bridge company, **75, ii, 683.** Modified by Board of Engineers, **75, ii, 683.**

MISSISSIPPI RIVER, CLINTON, IOWA. (Sp.)

(Railway.)

Commerce.

Influence of bridge upon navigation, **78, 989.**

Engineers.

CHIEF OF ENGINEERS. Approves recommendation of board, **77, 96, 817.**

BOARD OF ENGINEERS. 1876. Recommend the construction of 1,000 f. of sheer-booms. Report, **77, 819, 825.** (Cols. Macomb and Simpson, Majs. Warren, Suter, and Farquhar, and Capt. Allen.)

Legislation.

Bridge authorized by act of Feb. 27, 1867, **78, 987.** Abstracts of debates in Congress relating to Clinton bridge, **78,**

1051. Various acts relating to bridge **78, 1089, 1093.**

Physical characteristics.

Description of river and valley at locality of bridge, **78, 987.**

Plans.

Description of bridge, **77, 823; 78, 988.** Alterations recommended by Maj. Warren, **78, 989.** Proposed location for a high bridge, **78, 990.** Maj. Warren's report on bridge, **78, 987.**

Surveys.

MAPS. Diagram of piers, **78, 985.** Maps of locality of bridge, **78, 1126.**

MISSISSIPPI RIVER. NEAR CLINTON, IOWA. (Sp.)

(Clinton & Illinois Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 428.

BOARD OF ENGINEERS. Constituted by S. O. No. 10, Mar. 11, 1890. (Lt. Col. C. R. Suter, Maj. A. Mackenzie, and Capt. W. L. Marshall.)

ENGINEER IN CHARGE. Maj. A. Mackenzie.

Legislation.

Company authorized to construct bridge by act of July 16, 1888, amending act Mar. 1, 1890, 91, 428.

Plans.

Plans for bridge at Stoney Point submitted Feb. 1, 1889, withdrawn; new plans

with location below bridge of the Chicago & Northwestern Ry. Co. disapproved July 16, 1889. Plans for a high bridge at Stoney Point submitted Nov. 12, 1889; referred to Board of Engineers, who reported Mar. 31, 1890, adversely on this location and suggested a place about a mile below city near railroad bridge; revised plans in accordance with above suggestion approved Sept. 22, 1890. Modification of superstructure of certain spans submitted Jan. 21, 1891; approved Feb. 10, 1891. Modification of arrangement of east channel span submitted June 26, 1891; approved July 10, 1891. 91, 428.

MISSISSIPPI RIVER, BETWEEN DAVENPORT, IOWA, AND ROCK ISLAND, ILL. (Sp.)

(Davenport & Rock Island Ry. Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 474.

ENGINEER IN CHARGE. Lt. Col. A. Mackenzie.

Legislation.

Company authorized to construct bridge by act of Mar. 3, 1885, 95, 474.

Plans.

Plans were submitted Nov. 19, 1894; modified Jan. 5, 1895; approved Jan. 23, 1895, 95, 474.

MISSISSIPPI RIVER, DUBUQUE, IOWA. (Sp.)

(Railway.)

Commerce.

Influence of bridge upon navigation, 78, 985.

Engineers.

CHIEF OF ENGINEERS. Reports, 77, 96, 817; 83, 271, 1598; 84, 271.

BOARD OF ENGINEERS. Recommend, 1876, a sheer boom 1,200 f. in length. Report, 77, 819, 823. (Cols. Macomb and Simpson, Maj. Warren, Farquhar, and Suter, and Capt. Allen.)

Legislation.

Bridge authorized by act of July 25, 1866, 78, 983. Various acts relating to bridge, 78, 1089, 1093.

Act of Mar. 3, 1875, fixed the width of the draw span at 500 f. Act of May 29, 1884, reduced it to 400 f., 84, 271.

Physical characteristics.

Description of river valley at locality of bridge, 78, 983.

Plans.

Description of bridge, 77, 823; 78, 984. Proposed location of high bridge, 78, 986.

By Maj. Warren for extension of left rest pier 800 f., 78, 986.

Modifications in spans discussed by bridge company, 83, 1595, 1598. Recommended by Chief of Engineers, 83, 1598. Action of Congress necessary before modification can be made, 83, 1599.

Modified by act of May 29, 1884, 84, 271.

Surveys.

MAPS. Diagram of piers, 78, 985. Maps of locality of bridge, 78, 1126 (Nos. 15 and 16).

MISSISSIPPI RIVER, DUBUQUE, IOWA. (Sp.)

Commerce.

Dimensions of the largest Mississippi packet boats, 88, 2496.

Engineers.

CHIEF OF ENGINEERS. Report, 88, 309.

Legislation.

Bridge authorized by act of Feb. 21, 1887, 88, 2493.

Plans.

Maj. Mackenzie reported the dimensions of the bridge spans such as to furnish no obstruction to the passage of the largest Mississippi boats 88, 2496-97.

MISSISSIPPI RIVER, DUBUQUE, IOWA. (Sp.)

(Pontoon.)

Commerce.

Would be seriously obstructed by proposed bridge, 76, ii, 311, 313.

Engineers.

CHIEF OF ENGINEERS. Reports, 76, 92, ii, 308.

BOARD OF ENGINEERS. Convened at Dubuque, Iowa, May 31, 1875. Bridge on proposed site would be very injurious to navigation. 76, ii, 311. Report, 76, ii, 309. Reconvened Oct. 15, 1875. Site inadmissible so long as the bar in front of the city exists, 76, ii, 313. Report, 76, ii, 312. Reconvened Mar. 15, 1876. The

board approve of the revised plans and change of site presented by the bridge company, 76, ii, 309. Report, 76, ii, 309. Approved by Chief of Engineers and Secretary of War, 76, ii, 308. (Col. Macomb and Maj. Farquhar and Suter.)

Legislation.

Bridge authorized by act of Mar. 3, 1875, 76, ii, 308, 309.

Plans.

Submitted by J. P. Quigley, 76, ii, 309. Description of, 76, ii, 309. Discussed by board, 76, ii, 309. Report of Maj. Warren, 78, 986.

MISSISSIPPI RIVER, BETWEEN DUBUQUE, IOWA, AND DUNLEITH (EAST DUBUQUE), ILL. (Sp.)

(Dubuque & Dunleith Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 619.

Legislation.

Company authorized to construct bridge by act of July 25, 1866, 99, 619.

Plans.

Reconstruction plans approved Mar. 4, 1890, 99, 619.

MISSISSIPPI RIVER, FORT MADISON, IOWA. (Sp.)**Legislation.**

Bridge authorized by acts of Apr. 1,

1872, and May 17, 1872, 78, 1091, 1092.

MISSISSIPPI RIVER, FORT SNELLING, MINN. (Sp.)**Engineers.**

CHIEF OF ENGINEERS. Reports, 78, 111; 80, 200.

BOARD OF ENGINEERS. The Board approved plan, 80, 200. (Gen. Terry and Col. Warren.)

Legislation.

Bridge authorized by act of June 30, 1878, 80, 199, 1869.

Plans.

For construction of a free wagon bridge, with stone abutments and iron superstructure, 78, 111. Approved by the Secretary of War, 78, 111.

Test of bridge assigned to Capt. C. J. Allen, 80, 200. Report of, 80, 1869.

MISSISSIPPI RIVER, HANNIBAL, MO. (Sp.)

(Railway.)

Commerce.

Number of rafts passing the bridge, 77, 826. Effect of bridge upon navigation, 78, 1017. At high water a very serious obstruction to navigation, 78, 1017.

Engineers.

CHIEF OF ENGINEERS. Approved recommendations of board, 77, 817.

BOARD OF ENGINEERS. Recommended, 1876, the placing of a sheer boom 1,200 f. in length at this bridge. Report, 77, 819, 826. (Cols. Macomb and Simpson, Maj. Warren, Farquhar, and Suter, and Capt. Allen.)

Legislation.

Bridge authorized by act of July 25, 1866, 77, 826; 78, 1015, 1089.

Physical characteristics.

Description of the river and valley in the vicinity of the bridge, 78, 1015.

Plans.

Dimensions of the bridge, 77, 826; 78, 1016. Report of Maj. Warren on plans of bridge, 78, 1015. Height required for high bridge, 78, 1019.

Surveys.

MAPS. Of locality of bridge, 78, 1126 (No. 27).

MISSISSIPPI RIVER, ABOVE HANNIBAL, MO. (O.)

(Hannibal Bridge Co., controlled by the Wabash Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 373.

Plans.

Alterations required by Mar. 1, 1889;

time extended to Nov. 8, 1888. No action taken by the companies interested. 89, 373, 374.

MISSISSIPPI RIVER, HASTINGS, MINN. (Sp.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 474.

ENGINEER IN CHARGE. Lt. Col. A. Mackenzie.

Legislation.

City authorized to construct bridge by act of June 29, 1894, 95, 474.

Plans.

Approved Nov. 9, 1894. Reported completed. 95, 474.

MISSISSIPPI RIVER, HASTINGS, MINN. (S.)

(Railway, draw.)

Commerce.

Influence of bridge upon navigation, 78, 969.

Legislation.

Bridge authorized by Minnesota Feb. 7, 1867, 78, 967.

Plans.

Description of bridge, 78, 969.

Proposed location for high bridge, 78, 970.

Of Maj. Warren for extension of sheer booms and the placing of bridge signals above bend in river, 78, 970.

MISSISSIPPI RIVER, POINT BETWEEN KANSAS CITY AND FIVE MILES BELOW, MO. (Sp.)

(Randolph & Kansas City Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 372.

ENGINEER IN CHARGE. Lt. Col. C. R. Suter.

Legislation.

Company authorized to construct bridge by act of July 23, 1888, 89, 372.

Plans.

Plans for a pontoon drawspan bridge approved July 26, 1889, 89, 372.

MISSISSIPPI RIVER, KEITHSBURG, ILL. (Sp.)

Engineers.

CHIEF OF ENGINEERS. Report, 86, 369, 2111.

Legislation.

Bridge authorized by act of Apr. 26, 1882, 86, 369.

Plans.

After certain modifications the plan and location were approved by the Secretary of War, 86, 369, 2111.

MISSISSIPPI RIVER, KEOKUK, IOWA. (Sp.)

(Rail and high way.)

Commerce.

Influence of bridge upon navigation, 78, 1008.

Engineers.**CHIEF OF ENGINEERS.** Approved recommendations of board, 77, 96, 817.**BOARD OF ENGINEERS.** Recommended, 1876, the placing of 1,200 f. of sheer booms. Report, 77, 819, 825. (Cols. Macomb and Simpson, Majs. Warren, Farquhar, and Suter, and Capt. Allen.)**Legislation.**

Bridge authorized by act of July 25, 1866, 77, 825; 78, 1006, 1089.

Physical characteristics.

Description of river and valley at locality of bridge, 78, 1006.

Plans.

Dimensions of bridge, 77, 825; 78, 1007.

Maj. Warren's report on plans of bridge, 78, 1006.

Alterations proposed by Maj. Warren, 78, 1009.

Proposed location of high bridge, 78, 1010.

MISSISSIPPI RIVER, KEOKUK, IOWA. (O.)

(Keokuk & Hamilton bridge.)

Engineers.**CHIEF OF ENGINEERS.** Report, 89, 376.**Legislation.**

As the Co. failed to comply with the requirements of the notice served on them, the matter was referred Apr. 13,

1889, to the Attorney-General for such action as is required by law, 89, 376.

Plans.

Alterations required by Mar. 31, 1889, 89, 376.

MISSISSIPPI RIVER, LA CROSSE, WIS. (Sp.)

(City.)

Engineers.**CHIEF OF ENGINEERS.** Report, 90, 336.**Legislation.**

Authorized by act of Feb. 23, 1889, 90, 336.

Plans.

Plan and location submitted, and approved by Secretary of War Sept. 30, 1889, 90, 336.

MISSISSIPPI RIVER, LA CROSSE, WIS.

(Railway.)

Commerce.

Railroad and city interests described and discussed, 73, 564, 574. Growth of Milwaukee & St. Paul R. R. and of Wisconsin, 73, 576. Influence of bridge on navigation, 78, 972.

Engineers.**CHIEF OF ENGINEERS.** Reports, 73, 63; transmits papers and copies of acts to Maj. Warren for report, 73, 553. Report on sheer booms for bridge piers of Mississippi River, 77, 96, 817.**BOARDS OF ENGINEERS:**

Convened at La Crosse July, 1872, condemned all the sites thereto proposed, and selected a site at foot of Mount Vernon street, La Crosse, as most suitable for highway as well as railway purposes. Report, 73, 563, et seq.

Reconvened Sept. 25, 1872, upon decision of Attorney-General (regarding the highway reference in act of June 4,

1872, 73, 565); Board adhered to their original decision, which was approved by Chief of Engineers and Secretary of War, 73, 572. Report, 73, 572.

Convened at La Crosse, Wis., Jan. 15, 1875. Recommendations of, 78, 721, 722, 723. Report, 78, 721. (Col. Macomb and Majs. Weitzel and Merrill.)

Recommend, 1876, the placing of 1,000 f. of sheer-boom above abutment. Report, 77, 819, 822. (Cols. Macomb and Simpson, Majs. Warren, Farquhar, and Suter, and Capt. Allen.)

Legislation.

Acts of Congress relating to bridge. Act of July 25, 1866, compared in full with act of Apr. 1, 1872, 73, 561. Act of Feb. 21, 1868, described, 73, 555. No bridge built under this act, 78, 973. Acts of Apr. 1, 1872, and June 4, 1872, described, 73, 555. Act of June 4, 1872, in full, 73, 563. Opinion of Attorney-

MISSISSIPPI RIVER, LA CROSSE, WIS.—Continued.

General regarding reference therein to highways, 73, 570. Various acts relating to bridge referred to, 78, 1089, 1091, 1093.

Physical characteristics.

Of La Crosse and region surrounding, 73, 556, 564.

Crossings of river described, 73, 556; 78, 974.

Plans.

Of St. Paul R. R. Co., by J. T. Dodge, filed by A. Mitchell, president, Milwaukee & St. Paul R. R. Co., for a bridge at Minnesota Island, 2 miles above La Crosse, crossing the Mississippi and Black rivers, 73, 555. Petition of mayor of La Crosse and president of Board of Trade, and of governor of Wisconsin, protesting against this location, 73, 555. Letter of J. M. Rusk thereon, requesting a Board of Engineers, 73, 555. Remarks by Maj. War-

ren on this plan and site, 73, 557, 560. Location disapproved by Board of Engineers, 73, 566.

Plan of city of La Crosse for a bridge in city, discussed by Maj. Warren, 73, 558; by Board of Engineers, 73, 566.

Plan of Southern Minnesota R. R. Co. for a bridge at "Travers de Sioux," 2 miles below the city of La Crosse. Remarks on by, Maj. Warren, 73, 559; by Board of Engineers, 73, 567.

Plan of Board of Engineers for a bridge at foot of Mount Vernon street, La Crosse, described, 73, 567. Description of bridge, 77, 822. Proposed location of high bridge, 78, 979. Reports of Maj. Warren, 73, 554; 77, 817, 822; 78, 973.

Surveys.

MAPS. Of locality of bridge, 78, 1126 (Nos. 11 and 12). Diagram of piers, 78, 977.

MISSISSIPPI RIVER, LOUISIANA, MO. (Sp.)

Commerce.

Commercial and R. R. interests described and discussed by Board of Engineers, 73, 579.

Number of rafts passing the bridge, 77, 820.

Influence of bridge upon navigation, 78, 1021.

Engineers.

CHIEF OF ENGINEERS. Report, 77, 817.

BOARDS OF ENGINEERS:

Convened at St. Louis, Mo., June 21, 1873; reported in favor of site selected, but with modifications of plan, and additions costing \$81,800. Report, 73, 578. Approved by Chief of Engineers, 73, 577. (Col. Simpson and Majs. Weitzel, Merrill, and Suter.)

Recommended, 1876, that the crib work or bulkhead above the rest pier be extended upstream 500 f., and a fixed boom from its upper end 820 f. Report, 77, 821. (Cols. Macomb and Simpson, Majs. Warren, Farquhar, and Suter, and Capt. Allen.) Approved by Chief of Engineers, 77, 817.

Legislation.

Acts of Congress authorizing bridge, Mar. 3, 1871, 77, 826. Acts modifying same, of Apr. 1, 1872, and June 4, 1872, 77, 826; 78, 1018. Acts referred to, 78, 1090.

Physical characteristics.

Description of river and valley at the locality of bridge, 78, 1019.

Plans.

By E. L. Corthell, chief engineer of Louisiana & Missouri River R. R. Co., submitted to Secretary of War, 73, 578. Objections to same by Board of Engineers, 73, 579. Revised by E. L. Corthell, and approved by Chief of Engineers and Secretary of War, 73, 584. Description of the bridge, 77, 826; 78, 1019. Accessory works, 78, 1021. Proposed alterations, 78, 1022. Proposed location of high bridge, 78, 1024. Report of Maj. Warren, 77, 817; 78, 1018.

Surveys.

MAPS. Of locality of bridge, 78, 1126 (Nos. 28 and 29). Diagram of piers, 78, 1020.

MISSISSIPPI RIVER. (Sp.)

(Lyons and Fulton Bridge Co., at Lyons, Iowa.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 337.

Legislation.

Authorized by acts of Mar. 2, 1889, and Mar. 15, 1890, 90, 337.

Plans.

Plan and location submitted, and approved by Secretary of War Apr. 22, 1890, 90, 338.

MISSISSIPPI RIVER, MEMPHIS. (Sp.)

(Kansas City and Memphis R. R. and Bridge Co.)

Engineers.**CHIEF OF ENGINEERS.** Reports, **88**, 309; **89**, 369.**BOARD OF ENGINEERS.** Convened at Memphis, May 26, 1888, by S. O. No. 26, to examine and report upon the plans of the proposed bridge across the Mississippi River at Memphis. Majority report in favor of a main span of 1,000 f., 2 other spans of 600 f. each, and the whole structure to be 75 f. above h. w., **88**, 2517,2522. (Maj. Ernst, Capt. Kingman, and Capt. Gillette.) Minority report in favor of a main span of 700 f., **88**, 2521. (Lt. Col. Merrill.) Secretary of War decides in favor of a main span of 770 f., **88**, 2516.**Legislation.**Authorized by act of Apr. 24, 1888, **88**, 2514, 2525.**Plans.**Approved Aug. 23, 1888, **89**, 369.**MISSISSIPPI RIVER, MINNEAPOLIS, MINN.**

(Stone arch.)

Engineers.**CHIEF OF ENGINEERS.** Report, **86**, 369.**BOARD OF ENGINEERS.** Convened to consider the effect of such a bridge upon the works of the U. S. for the preservation of the Falls of Saint Anthony, **86**, 2111. The Board did not think these works wouldbe jeopardized by the construction of the proposed bridge, **86**, 2113. (Lt. Col. Poe, Maj. Mackenzie and Allen.)**Plans.**An arch bridge of stone of 4 spans of 125 f. each, **86**, 2112.**MISSISSIPPI RIVER, MINN. (S.)**

(Eastern Ry. Co.)

Engineers.**CHIEF OF ENGINEERS.** Report, **98**, 535.**Plans.**Approved Apr. 7, 1898, **98**, 535.**MISSISSIPPI RIVER, MUSCATINE, IOWA. (Sp.)****Legislation.**Bridge authorized by act of Apr. 1, 1872, **78**, 1091.**MISSISSIPPI RIVER, MUSCATINE, IOWA. (Sp.)**

(Muscatine Bridge Co.)

Engineers.**CHIEF OF ENGINEERS.** Report, **90**, 336.**Legislation.**

Authorized by act of July 16, 1888.

Plans.Plan and location submitted by the company, and approved by Secretary of War, June 11, 1889, **90**, 336.**MISSISSIPPI RIVER, AT OR NEAR NEW ORLEANS, LA.****Commerce.**Commercial interests affected, **90**, 3455.**Engineers.****CHIEF OF ENGINEERS.** Report, **90**, 3453.**BOARD OF ENGINEERS.** Convened at New Orleans, La., June 14, 1890, by S. O. No. 29, to report upon the erection of ahigh-level bridge across the Mississippi near New Orleans. No bridge should be built at or below the city; one could be built above the city without serious obstruction to navigation. **90**, 3454. (Col. Comstock, Lt. Col. Suter, Maj. Ernst and Allen, and Capt. Kingman.)

MISSISSIPPI RIVER (ABOVE AND BELOW), NEW ORLEANS, LA.

Commerce.

Commercial interests involved, 90, 3451.

Engineers.

CHIEF OF ENGINEERS. Report, 90, 3450.

BOARD OF ENGINEERS. Convened at New Orleans, La., Nov. 30, 1889, by S. O. No. 47, to report upon the question of the erection of bridges across the Mississippi

above and below New Orleans. The board reported that any bridge across this portion of the river would be an obstruction, and that but one bridge was needed for railway purposes at New Orleans, and that should be located above the city. 90, 3457. (Col. Comstock, Maj. Allen, and Capt. Kingman.)

MISSISSIPPI RIVER, ABOVE NEW ORLEANS, LA. (Sp.)

(Southern Bridge & Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 465.

ENGINEER IN CHARGE. Capt. J. Millis.

Legislation.

Construction authorized by act of Jan. 26, 1893, 93, 465.

Plans.

Approved Apr. 19, 1893, 93, 465.

MISSISSIPPI RIVER, PRAIRIE DU CHIEN, WIS. (Sp.)

(Pontoon railway.)

Commerce.

Influence of bridge on navigation, 78, 983.

Engineers.

CHIEF OF ENGINEERS. Report, 74, 71. Approved recommendations of Board, 77, 96, 817.

BOARD OF ENGINEERS. Sheer booms, 1876, not necessary, 77, 819, 823. (Cols. Macomb and Simpson, Majs. Warren, Farquhar, and Suter, and Capt. Allen.)

Legislation.

Bridge authorized by act of July 25, 1866, 78, 980. Legalized by act of June 6, 1874, 77, 823. Various acts relating to bridge, 78, 1089, 1093.

Plans.

Description of bridge, 74, 681; 77, 823, 78, 981. Reports of Col. Macomb and E. F. Hoffman, 74, 681. Plan of bridge designed by J. Lawler, 78, 983. Plan discussed by Maj. Warren, 78, 983. Proposed location of high bridge, 78, 983.

Physical characteristics.

Description of river in vicinity of the bridge, 78, 980.

Surveys.

MAPS. Of locality of bridge, 78, 1126 (Nos. 13 and 14).

MISSISSIPPI RIVER, BETWEEN PRAIRIE DU CHIEN, WIS., AND NORTH M'GREGOR, IOWA. (Sp.)

(Chicago, Milwaukee & St. Paul Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 532.

Legislation.

Company authorized to reconstruct bridge by act of Mar. 30, 1898, 98, 532.

Plans.

Reconstruction plans approved June 29, 1898, 98, 532.

MISSISSIPPI RIVER, QUINCY, ILL. (Sp.)
(Railway.)

Commerce.

Influence of bridge upon navigation, 78, 1012.

Engineers.

CHIEF OF ENGINEERS. Approved the recommendation of Board, 77, 96, 817.

BOARD OF ENGINEERS. Recommended a fixed sheer boom 1,000 f. in length. Report, 77, 819, 825. (Cols. Macomb and Simpson, Maj. Warren, Farquhar, and Suter, and Capt. Allen.)

Legislation.

Bridge authorized by act of July 25, 1866, 78, 1010. Various acts relating to bridge referred to, 78, 1089, 1091.

Physical characteristics.

Description of the river and valley at location of bridge, 78, 1010.

Plans.

Dimensions of bridge, 77, 825; 78, 1011. Report of Maj. Warren, 78, 1010. Alterations necessary, 78, 1014. Proposed location of high bridge, 78, 1015. Incompatibilities of the law for building drawbridges, 78, 1014.

Surveys.

MAPS. Of location of bridge, 78, 1126 (Nos. 25 and 26). Diagram of piers, 78, 1011.

MISSISSIPPI RIVER, RED WING, MINN. (Sp.)

Legislation.

Bridge authorized by act of July 25, 1866, and June 10, 1872, 78, 1092.

MISSISSIPPI RIVER, RED WING, MINN. (Sp.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 425.

ENGINEER IN CHARGE. Maj. A. Mackenzie.

Legislation.

City authorized to construct bridge by act of May 12, 1894, 94, 425.

Plans.

Approved June 16, 1894, 94, 425.

MISSISSIPPI RIVER, ILL. (Rock Island bridge over, construction of). (Sp.)

Appropriations.^a

1867, \$200,000, 70, 252.

1869, 500,000, 70, 253.

1870, 300,000, 70, 58.

1877, 15,000 (sheer booms), 77, 145, 78, 97.

Total, 1,015,000

Commerce.

Effect of bridge on navigation, 77, 824; 78, 1002.

Contracts.

Harvey & Livesey, masonry, 71, 299. Annulled for lack of energy, 71, 300. Efforts to obtain damages, 71, 300. Baltimore Bridge Co., three spans of superstructure, \$459,784, 71, 301; contract extended, 71, 302. Satisfactory work done, 72, 279, 292. Eau Claire Lumber Co., construction of sheer booms at bridge, 77, 818.

PROPOSALS. To be invited for plans 1, 2, and 3 of Maj. Warren and for spans of

80, 150, and 190 f. 70, 262. Specifications on which proposals were based, 72, 286. For superstructure; abstracts of, 71, 301; 72, 287.

Engineers.

CHIEF OF ENGINEERS. Reports, 68, 50; 69, 44; 70, 58, 240; 71, 57; 72, 49; 73, 52; 77, 96, 817; 78, 97; 79, 132. Letter of, to Maj. Warren, stating objections of Lt. Col. Rodman to location of draw, 70, 229.

BOARDS OF ENGINEERS:

Reported, 1859, that the bridge not located or constructed with proper regard to the interests of navigation, piers not of the best form, and improperly placed with reference to direction of currents, 67, 291; 68, 1036. (Capts. Humphreys, Meade, and Franklin.)

Board of Commissioners authorized by act of Congress Apr. 19, 1864, 70, 247. Report of, 70, 248. Limited in expenditures on bridge, 70, 253. Control of

^aReversion to Treasury of \$500,000, 70, 58; reappropriated, 71, 256. Act of Congress provides that expenditures on part of the United States shall not exceed \$1,000,000, 70, 258. Statements of appropriations, 69, 44; 70, 58, 252, 253; 71, 57, 256.

MISSISSIPPI RIVER, ILL. (Rock Island bridge over, construction of). (Sp.)—Continued.

bridge assigned to Engineer Department, 69, 44. (Brig. Gen. Schofield, J. Barnes and S. M. Church.)

To examine and report on the expediency of constructing sheer booms, to be placed at the upper end of all or any bridge piers on the Mississippi River, 77, 821. Recommended the removal of the remains of the old north pier and the construction of sheer booms, 77, 819, 824. (Cols. Macomb and Simpson, Majs. Warren, Farquhar, and Suter, and Capt. Allen.)

ENGINEERS IN CHARGE:

Maj. G. K. Warren, 1869-71. Reports on bridging navigable waters of the United States, 68, 315; 78; 900, 991, 1033. Reports, 69, 194; 70, 236, 240, 256.

Col. J. N. Macomb, 1871-78. Reports, 71, 256; 72, 279; 73, 415; 78, 710.

Maj. F. U. Farquhar, 1878-79. Reports, 78, 710; 79, 1144.

Maj. D. W. Flagler (Ordnance), 79, 1144, 1145.

ASSISTANTS:

Capt. W. H. H. Benyaurd, in charge of designs for superstructure, 69, 199. Reports, 70, 263; 71, 301; 72, 286.

Capt. A. Stickney, in charge of masonry, 69, 199. Reports, 71, 298; 72, 293.

Capt. A. H. Burnham, in local charge, 73, 416.

G. B. Nicholson, inspector of ironwork, 72, 292.

E. F. Hoffman. Report, 79, 1145.

Estimates. (See *Plans and Projects*.)

By E. H. Johnson, C. E., of Chicago, Rock Island & Pacific R. R. (made for board of commissioners), for a single-track bridge, with passage for highway 17 f. wide, \$1,296,292, 69, 194; 70, 237, 249.

By Maj. Warren, on basis and plans of E. H. Johnson, for double-track railroad and highway bridge, with approaches, \$2,134,168, 69, 194; 70, 251. Estimated saving of plan suggested by Maj. Warren over plan of E. H. Johnson, \$125,966, 69, 195.

By Lt. Col. T. J. Rodman, U. S. A., plan No. 1, \$1,234,525; plan No. 2, \$978,085, 70, 257. Plan No. 3, \$934,291, 70, 258.

By Maj. Warren, plan No. 2, \$2,187,547, 70, 246, 264. Plan No. 3, \$1,282,356, 70, 246, 266. Cost to U. S. of plan No. 3, \$587,675; cost to railroad company of plan No. 3, \$694,681, 70, 246. Review of previous estimates, 78, 992.

Expenditures. (See also *Financial statements*.)

On part of U. S. not to exceed \$1,000,000, 70, 253. Relative expense to be borne by U. S. and railroad company, 70, 237, 246.

Financial statements.

71, 256, 262; 72, 279, 285; 73, 416; 78, 97, 711; 79, 132, 1145. Payment to U. S. by railroad company, \$177,320.25, 73, 415.

Legislation.

Act June 27, 1866, * * * for establishment of an armory * * * on Rock Island; authorizing the Secretary of War to fix location of bridge, and to grant to the railroad companies and other parties in interest pecuniary aid toward changing present location of bridge and road; action to be under control of board of commissioners, as fixed by act of Apr. 19, 1864, 70, 247, 254.

Act July 25, 1866, to authorize the construction of certain bridges, * * * fixing minimum height of lower chord above h. w., length of span, and position of piers, 70, 249.

Act Mar. 2, 1867, making appropriations for support of Army and other purposes, \$200,000 provided for the construction of bridge at Rock Island, 70, 252.

Act Mar. 3, 1869, making appropriations for support of Army and other purposes, \$500,000 provided for construction of bridge at Rock Island, 70, 253.

Act July 20, 1868, in relation to bridge, authorizing commencement of, with general provisions and conditions, and providing that the expenditures on part of U. S. shall not exceed \$1,000,000, 70, 253, 255. Action of Congress allowed a change to single-track railroad bridge with highway beneath, 70, 239. Various acts relating to construction of bridges, 77, 145, 824; 78, 1089, 1091.

Operations.

1868-69. Work commenced by contract on the Davenport abutment, 69, 198.

1869-70. Progress on substructure; completion of Davenport abutment; construction of cofferdam at draw pier; embankment for Davenport wagon road in progress, 70, 224; 71, 298.

1870-71. Completion of piers Nos. 1, 2, 3, and 4; masonry for pivot pier and Davenport wagon road embankment, 71, 298. Work taken from contractor and prosecuted with hired labor, 71, 300. Operations on superstructure commenced, 71, 301.

1871-72. Removal of rock from draw-span channel and completion of superstructure May 8, 1872, 72, 291, 295.

1872-73. Final completion and opening of bridge and transferment of to Ordnance Department, Feb. 4, 1873, 73, 52, 415.

1877-78. 1,150 l. f. of sheer boom built, 78, 97, 710, 997.

MISSISSIPPI RIVER, ILL. (Rock Island bridge over, construction of). (Sp.)—Continued.

1878-79. Repairs of sheer boom, 79, 132, 1144, 1145.

Physical characteristics.

Of valley of river, 68, 315.

Sectional area of natural waterway at location of bridge, 69, 197; 78, 1001.

Velocity of current at bridge, 69, 197.

Plans. (See *Estimates and Projects.*)

For wagon way, width 26 f., with two sidewalks, of 6 f. each, considered by board of commissioners and rejected as giving pivot pier too great width, 69, 194; 70, 242.

By E. H. Johnson, for single-track railroad, truss to be 16 f. wide, with wagon road (without sidewalks) 17 f. wide, 69, 194; 70, 237, 241, 249.

By Lt. Col. Rodman, U. S. A., as follows: (1) Truss wide enough for double-track railroad and high enough for wagon road above railroad, 70, 257; (2) same arrangement of track and road, but only wide enough for single track, 70, 257; (3) same as plan No. 2, but with wagon road below single-track railroad, 70, 258.

By Maj. Warren, placing railroad above wagon road, (1) truss 33 f. high, 28 f. apart, wagon way 28 f. wide and 12 f. high, railroad with double tracks and two sidewalks, to be reached by steps from ends, 69, 195; 70, 244, 262; (2) trusses of same general dimensions as preceding, wagon road 18 f. wide, with two 5 f. sidewalks, double-track railroad above, 69, 195; 70, 244, 262; (3) single-track railroad, trusses 18 f. wide, with wagon road beneath 18 f. wide, and two sidewalks (outside of trusses) 5 f. wide, 69, 195; 70, 244, 262.

Maj. Warren recommended plan No. 3, 70, 246. General details of proposed plans, 70, 263.

Private and corporate work.

(See *Legislation.*)

Projects. (See *Estimates and Plans.*)

Act of Congress June 27, 1863, authorizing Secretary of War to fix location of bridge and grant pecuniary aid to parties interested, to aid them in changing present location and rebuilding, the details to be under immediate control of board of commissioners, 70, 247, 254.

Act of Congress July 25, 1866, fixing height of lower chord above h. w. on navigable streams; also length of spans and position of piers, 70, 249.

Proposition of Chicago, Rock Island &

Pacific R. R. Co. as to joint action with United States, 70, 248. Agreement and guaranty of, 70, 254.

Project adopted by board of commissioners (Brig. Gen. J. M. Schofield, J. Barnes, and S. M. Church). The Government to build over main channel a bridge with iron draw, the truss to be of proper width for double track, the wagon way to be planked high enough to leave lower chord for railroad track, 69, 194; 70, 248. The Chicago, Rock Island & Pacific R. R. Co. to have right of way over same, provided they pay to the United States one-half the cost of construction and maintenance of the part over the main channel, 70, 248, 253; it being provided that in no case shall the expenditures on the part of the United States exceed \$1,000,000, 70, 253, 256; project approved by Chief of Ordnance. By order of Secretary of War construction of bridge placed under control of Engineer Department, 69, 44. Modifications of law or plan necessary, 69, 194. Doubt as to details of plan adopted by board of commissioners, 69, 194; 70, 237, 241. Maj. Warren submitted that Board estimated for single-track railroad and narrow wagon road, 69, 194; 70, 237, 241. Piers designed and built so that either double or single track bridge could be put on them, 69, 195; 70, 240. Recommendations of Chief of Ordnance practically annulled, 70, 243.

Project of Maj. Warren, an iron bridge for single-track railroad with wagon way beneath; trusses to be 18 f. apart, wagon way 18 f. wide and 12 f. high, with two sidewalks 5 f. wide and outside of truss, 69, 195; 70, 244, 246, 262. Dimensions of bridge, 71, 301; 72, 287; 77, 824; 78, 1002. Location of axis of bridge, 69, 196; of draw, 69, 196, 198; 70, 229. Objections by Lt. Col. Rodman, 69, 196; 70, 229. Specifications for superstructure, 72, 286, 293. Draw span, details of, 72, 288, 293. Effect of combined railroad and highway bridge; railroad above highway most desirable, 70, 261. Test and acceptance of bridge, 72, 291. Completion and transferment to Ordnance Department, 73, 53, 415. History of, 70, 237, 241; 78, 416; 78, 992, 1002, 1003.

Secretary of War.

Orders the construction of bridge to be placed under control of Engineer Department, 69, 44.

MISSISSIPPI RIVER, SABULA, IOWA.

Engineers.

CHIEF OF ENGINEERS. Report, 81, 268, 2016.

Legislation.

Bridge authorized by act of Apr. 1, 1872, 81, 268.

Plans.

Requirements of Congress, 81, 2015. Maj. A. Mackenzie reported that the plans and location of bridge as proposed by the railroad company interfered as little as possible with the requirements of navigation, 81, 2016, 2018.

MISSISSIPPI RIVER (UPPER), BELOW FALLS OF ST. ANTHONY. (See *Navigable waters of the United States*.)

MISSISSIPPI RIVER, ST. LOUIS, MO. (Sp.)

Commerce.

Bridge a very serious obstruction to navigation, 74, 641. Names and dimensions of boats which pass the bridge, 74, 648. Height of steamboat chimneys, 74, 654. Importance of completion of the bridge, 74, 671.

Engineers.

CHIEF OF ENGINEERS. Report, 74, 71, 636. Approves report of Board of Engineers, 74, 637.

BOARD OF ENGINEERS. Convened at St. Louis, Mo., Sept. 2, 1873. Considered the bridge being constructed a very serious obstruction to navigation, 74, 641. Modification proposed, 74, 641. Report, 74, 638. Reconvened at St. Louis, Jan. 14, 1874. Recommended the construction of a canal behind the east pier, with a draw; estimate, \$1,172,436, 74, 650. Review of first report of Board by J. B. Eads, 74, 665. Reply of Board, 74, 653. "The substance of Mr. Eads's reply is that the majority of river steamboats must be rebuilt to conform to his bridge," 74, 662. Statements of various persons relating to report of Board of Engineers, 74, 664, 670, 671, 673, 674. Personal statement of Col. J. H. Simp-

son in reply to Mr. Eads, 74, 675. Of Maj. G. K. Warren, 74, 678. Reports of Board referred to, 78, 1077. Secretary of War approves report of Board, 74, 638. (Col. Simpson and Majs. Warren, Weitzel, Merrill, and Suter.)

Legislation.

Bridge authorized by act of July 20, 1868, 74, 637, 643. Various acts relating to the bridge referred to, 78, 1089, 1090, 1091, 1093.

Physical characteristics.

Description of the river and valley at locality of bridge, 78, 1024. High-water records, 74, 644, 645, 646. Duration of each stage, 74, 648.

Plans.

Plan and estimate of J. B. Eads, 78, 1060. Description of bridge, 78, 1025. Review of Mr. Eads's estimates, 78, 1028. Report of Maj. Warren upon bridge, 78, 1024. Description of proposed modifications of plans, by Board of Engineers, 74, 650. History of bridge, 78, 1055. Designs of bridges proposed by J. A. Roebling, C. E., 78, 1078. Sources of information concerning bridge, 78, 1078.

MISSISSIPPI RIVER, ST. LOUIS, MO.

Engineers.

CHIEF OF ENGINEERS. Report, 87, 338.

BOARD OF ENGINEERS. Report of Board of 1886. The Board was decidedly of

opinion that a low bridge with a draw should not be authorized below the mouth of the Missouri River, 87, 338, 2638.

MISSISSIPPI RIVER, ST. LOUIS, MO.

(St. Louis Merchants' Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 369.

ENGINEER IN CHARGE. Maj. A. M. Miller.

Legislation.

Company authorized to construct bridge by act of Feb. 3, 1887. Amended act Sept. 10, 1888, 89, 369.

Plans.

Approved Nov. 14, 1888, 89, 369.

MISSISSIPPI RIVER, ST. LOUIS, MO. (Sp.)

(St. Clair and Carondelet Bridge Co.)

Commerce.

Navigation of the Ohio compared with the Mississippi River, 75, ii, 680.

Engineers.

CHIEF OF ENGINEERS. Report, 75, 121. Approves report of Board, 75, ii, 677.

BOARD OF ENGINEERS. Convened at St. Louis, Mo., Aug. 3, 1874. Recommended—1. The acceptance of site No. 2, on certain conditions. 2. The prohibition of an arched bridge. 3. Reduction of channel openings to 450 f. 4. Con-

struction of a draw, 75, ii, 681. Comparison with other bridges, 75, ii, 680. Report, 75, ii, 678. Approved by Secretary of War, 75, ii, 677. (Col. Simpson and Maj. Merrill and Suter.)

Legislation.

Bridge authorized by act of Mar. 3, 1873, 75, ii, 678. Various acts relating to the bridge, referred to, 78, 1070, 1093.

Plans.

Description of plans, 75, ii, 678,

MISSISSIPPI RIVER, ST. PAUL.**Commerce.**

Influence of bridge upon navigation, 78, 967. Formerly a toll bridge, 78, 967.

Plans.

Description of bridge, 78, 965. Maj.

Warren's report on plan of bridge, 78, 965.

Surveys.

MAPS. Of locality of bridge, 78, 1126 (No. 6). Diagram of piers, 78, 966.

MISSISSIPPI RIVER, ST. PAUL, MINN. (S.)

(Railway.)

Commerce.

Influence of bridge upon navigation, 78, 965. Bridge opened for travel in 1869, 78, 963. Damages by collision with piers, decisions of the U. S. Supreme Court, 78, 1019.

Legislation.

Bridge authorized by act of the legislature of Minnesota Feb. 20, 1855; 78, 963.

Physical characteristics.

Description of river near location of bridge, 78, 963.

Plans.

Description of bridge, 78, 963. Proposed location of high bridge, 78, 963. Maj. Warren recommended that the bridge company be compelled to improve the river above the bridge, 78, 965. Report, 78, 964.

Surveys.

MAPS. Of location of bridge, 78, 1126 (No. 5).

MISSISSIPPI RIVER, ST. PAUL, MINN. (Sp.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 430.

ENGINEER IN CHARGE. Maj. A. Mackenzie.

Legislation.

City authorized to construct bridge by

act of July 5, 1884, amending act, Aug. 29, 1890, 91, 430.

Plans.

Approved Dec. 17, 1890, 91, 430.

MISSISSIPPI RIVER, SOUTH ST. PAUL, MINN. (Sp.)

(South St. Paul Belt R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 94, 425; 95, 474.

ENGINEER IN CHARGE. Maj. A. Mackenzie. 1894.

Legislation.

Company authorized to construct bridge by act of Apr. 26, 1890; amended

by acts of Feb. 24, 1891; Feb. 15, 1892, and Feb. 15, 1893, 94, 425.

Plans.

Plans submitted Dec. 7, 1893; modified Jan. 16, 1894; approved Feb. 7, 1894, 94, 425. Revised plans submitted Oct. 12, 1894; approved Nov. 1, 1894, 95, 474.

MISSISSIPPI RIVER, WARSAW, ILL. (Sp.)

Legislation.

Bridge authorized by act of May 17, 1872, 78, 1091, 1092.

MISSISSIPPI RIVER, WINONA, MINN. (Sp.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 431.
ENGINEER IN CHARGE. Maj. A. Mackenzie.

Legislation.

City authorized to construct bridge by act of Sept. 25, 1890, 91, 431.

Plans.

Approved June 4, 1891, 91, 431.

MISSISSIPPI RIVER, WINONA, MINN. (Sp.)

(Railway.)

Commerce.

Influence of bridge upon navigation, 78, 972.

Engineers.

CHIEF OF ENGINEERS. Report, 77, 96.
Approved recommendations of board, 77, 817, 818.

BOARD OF ENGINEERS. Recommended, 1876, a straight sheer boom from pier to 150 f. above the elevator. Report, 77, 819, 822. (Cols. Macomb and Simpson, Maj. Warren, Farquhar, and Suter, and Capt. Allen.)

Legislation.

Bridge authorized by act of July 25, 1866, 77, 822; 78, 970, 1089.

Plans.

Description of bridge, 77, 822; 78, 971. Proposed location of high bridge, 78, 973. Report of Maj. Warren, 78, 970.

Surveys.

MAPS. Of locality of bridge, 78, 1126 (Nos. 9 and 10). Diagram of piers, 78, 971.

MISSISSIPPI RIVER, WINONA, MINN. (Sp.)

(Winona & Southwestern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 427.
ENGINEER IN CHARGE. Maj. A. Mackenzie.

Legislation.

Company authorized to construct bridge by act of Aug. 13, 1888, 91, 427.

Plans.

Approved July 9, 1890. Sept. 7, 1891, bridge reported completed. 91, 427.

MISSOURI RIVER, ATCHISON, KANS.

(Railway, draw.)

Plans.

Description of bridge by Maj. Warren, 78, 1087.

MISSOURI RIVER, BELLEFONTAINE BLUFFS, MO. (Sp.)

(St. Louis, Keokuk & Northwestern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 337.

Legislation.

Authorized by act of Feb. 17, 1888, 90, 337.

Plans.

Plan and location submitted, and approved by Secretary of War, Dec. 21, 1889, 90, 337.

MISSOURI RIVER, BOONVILLE, MO. (Sp.)

(Boonville & Howard County Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 529.

Legislation.

Company authorized to construct bridge by act of May 25, 1896, 97, 529.

Plans.

Approved Sept. 11, 1896, 97, 529.

MISSOURI RIVER, BOONVILLE, MO. (Sp.)

(Railway, draw.)

Legislation.

Bridge authorized by act of May 11, 1872, 78, 1091.

Plans.

Description of bridge by Maj. Warren, 78, 1087.

MISSOURI RIVER, BROWNVILLE, NEBR. (Sp.)**Legislation.**

Bridge authorized by act of June 4, 1872, 78, 1092.

MISSOURI RIVER, BETWEEN COUNCIL BLUFFS, IOWA, AND EAST OMAHA, NEBR. (Sp.)

(Omaha Bridge & Terminal Ry. Co., formerly the Interstate Bridge & Street Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 91, 431; 93, 465.

ENGINEER IN CHARGE. Lt. Col. C. R. Suter, 1891, 1893.

Legislation.

Construction authorized by act of Feb.

13, 1891; amending act, Jan. 28, 1893, 91, 431; 93, 465.

Plans.

Original plans approved Mar. 5, 1891; modified plans approved May 9, 1893, 91, 431; 93, 465.

MISSOURI RIVER, GLASGOW, MO. (Sp.)**Engineers.**

CHIEF OF ENGINEERS. Report, 78, 111. Approved conclusions of board, 78, 897.

BOARD OF ENGINEERS. Convened at St. Louis, Mo., Apr. 15, 1878. The board approved the plan and location proposed by railroad company. Report, 78, 897. (Col. Simpson, Maj. Suter, and Capt. Allen.)

Legislation.

Bridge authorized by act of Mar. 3, 1871, 78, 1091.

Plans.

Dimensions of proposed bridge, 78, 898. Letter from W. S. Smith to Secretary of War, transmitting plans and drawings, 78, 897.

MISSOURI RIVER, JEFFERSON CITY, MO. (Sp.)

(Jefferson City Bridge & Transit Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 476.

ENGINEER IN CHARGE. Lt. Col. C. R. Suter.

Legislation.

Company authorized to construct bridge by act of May 28, 1894, amending act Jan. 8, 1895, 95, 476.

Plans.

Approved July 22, 1895; depth of water to and through drawspans to be maintained at not less than that found in adjacent improved parts of the river, 95, 476.

MISSOURI RIVER, KANSAS CITY, MO. (Sp.)

Commerce.

Complaints against the bridge as an obstacle to navigation, 69, 307, 308.

Engineers.

CHIEF OF ENGINEERS. Report, 69, 51.
Capt. Suter ordered to report, 69, 307.

Legislation.

Act authorizing, referred to, 69, 306.
Act of July 25, 1866, partly given, 69, 309; 78, 1089.

Physical characteristics.

Of Missouri River at Kansas City, 69, 304.

Plans.

Description of proposed bridge, 69, 304; 78, 1087. Objections to location arising from the difficulty in seeing the bridge by descending boats, 69, 306. Report of Capt. Suter, 69, 303, 304.

MISSOURI RIVER, LEAVENWORTH, KANS.

(Railway.)

Plans.

Description of bridge by Maj. Warren, 78, 1087.

MISSOURI RIVER, BETWEEN LEAVENWORTH, KANS., AND PLATTE COUNTY, MO. (Sp.)

(Leavenworth & Platte County Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 89, 372; 91, 428; 92, 405.

ENGINEER IN CHARGE. Lt. Col. C. R. Suter, 1889, 1891, 1892.

Legislation.

Company authorized to construct bridge by act of Feb. 25, 1889, 89, 372; amending act, July 25, 1890, 91, 428.

Plans.

Plans for a ponton bridge approved June 20, 1889, 89, 372. Act of July 25, 1890, provided for a pivot drawbridge instead of a ponton; plans approved Sept. 25, 1890, 91, 428. Plans approved to change the location from Cherokee to Choctaw street, Leavenworth, Apr. 27, 1892, 92, 405.

MISSOURI RIVER, LEXINGTON, MO. (Sp.)

Legislation.

Bridge authorized by act of July 25, 1866, and March 3, 1873, 78, 1093.

MISSOURI RIVER, LEXINGTON, MO. (Sp.)

(Lexington Bridge & Terminal Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 475.

ENGINEER IN CHARGE. Lt. Col. C. R. Suter.

Legislation.

Company authorized to construct bridge by act of July 26, 1894, 95, 475.

Plans.

Approved July 9, 1895, 95, 475.

MISSOURI RIVER, NEBRASKA CITY, NEBR. (Sp.)**Commerce.**

Rafting interests insignificant on the Missouri River, 73, 589. Railroad interests, 73, 591.

Engineers.

CHIEF OF ENGINEERS. Report, 88, 308.

BOARD OF ENGINEERS. Convened at Nebraska City, Jan. 20, 1873, approved site and plan with slight modifications. Report, 73, 588. Concurred in by Chief of Engineers and approved by the Secretary of War, 73, 587. (Col. Simpson and Maj. Weitzel and Suter.)

Legislation.

Bridge authorized by act of June 4, 1872, 73, 586; 88, 2464. Various acts relating to the bridge, 78, 1090, 1094.

Plans.

Submitted to Secretary of War by Nebraska City Bridge Co. Dec. 5, 1872. Briefly described by Chief of Engineers, 73, 586.

Lt. Col. Suter approved the location and dimensions of the proposed bridge, with the exception that the proposed height be increased from 48 to 50 f. above extreme high water, 88, 2465.

MISSOURI RIVER, NEBRASKA CITY, NEBR. (Sp.)

(City.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 337.

Legislation.

Authorized by act of July 16, 1888, 90, 337.

Plans.

Plan and location submitted, and approved by Secretary of War Apr. 3, 1890, 90, 337.

MISSOURI RIVER, OMAHA, NEBR. (Sp.)

(Railway.)

Legislation.

Bridge authorized by act of Feb. 24, 1871, under provisions of act of July 25, 1866, 78, 1090.

Plans.

Description of bridge by Maj. Warren, 78, 1087.

MISSOURI RIVER, BETWEEN OMAHA AND COUNCIL BLUFFS. (Sp.)

(Omaha & Council Bluffs R. R. and Bridge Co., railway and wagon.)

Engineers.

CHIEF OF ENGINEERS. Report, 88, 309.

Legislation.

Bridge authorized by act of Mar. 3, 1887, 88, 2467.

Plans.

Maj. Raymond reported that the bridge as proposed would not interfere with the existing requirements of navigation, 88, 2469.

MISSOURI RIVER, OMAHA, NEBR. (Sp.)

(Nebraska Central R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 337.

Legislation.

Authorized by act of June 22, 1888, 90, 337.

Plans.

Plan and location submitted, and approved by Secretary of War Feb. 27, 1890, 90, 337.

MISSOURI RIVER, NEAR QUINDABO, KANS., ABOUT 8.6 MILES ABOVE HANNIBAL AND ST. JOSEPH RAILROAD BRIDGE AT KANSAS CITY. (Sp.)

(Kansas City Terminal Rwy. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 430.

ENGINEER IN CHARGE. Lt. Col. C. R. Suter.

Legislation.

Company authorized to construct

bridge by act of Mar. 1, 1889, amending act June 28, 1890, 91, 430.

Plans.

Approved Dec. 1, 1890, 91, 430.

MISSOURI RIVER, ST. CHARLES, MO.

(Railway.)

Plans.

Description of the bridge by Maj. Warren, 78, 1087. Cost of, \$1,797,186.19, 78, 1087.

MISSOURI RIVER, ST. CHARLES, MO. (Sp.)

(Occidental Bridge & Construction Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 465.

ENGINEER IN CHARGE. Lt. Col. C. R. Suter.

Legislation.

Construction authorized by act of May 23, 1892, 93, 465.

Plans.

Plans submitted Feb. 21, 1893, modified Apr. 11, 1893; approved Apr. 29, 1893, 93, 465.

MISSOURI RIVER, ST. CHARLES, MO. (Sp.)

(St. Charles & St. Louis County Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 698.

Legislation.

Counties authorized to construct bridge

by act of June 3, 1896, amending acts May 28, 1898, and Jan. 27, 1900, 1900, 698.

Plans.

Approved June 27, 1900, 1900, 698.

MISSOURI RIVER, ST. JOSEPH, MO. (Sp.)

(Rail and highway.)

Legislation.

Bridge authorized by acts of July 20, 1868; July 14, 1870, and Mar. 5, 1872, 78, 1089, 1090, 1091.

Plans.

Description of bridge by Maj. Warren, 78, 1087.

MISSOURI RIVER, MOST ACCESSIBLE POINT BETWEEN SIBLEY AND KANSAS CITY, MO. (Sp.)

(Kansas City & Atlantic R. R. Co., successors to the Chicago, Kansas City & Texas Rwy. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 89, 370; 96, 422; 99, 619.

ENGINEER IN CHARGE. Lt. Col. C. R. Suter, 1889.

Legislation.

Original company authorized to construct bridge by act of Mar. 3, 1887, 89, 370. Owners received authority from

same act, as extended by act of Mar. 29, 1894, 96, 422.

Plans.

Original company's plans approved Feb. 14, 1889; bridge partly constructed, 89, 370. Owner's new plans approved Dec. 17, 1895, 96, 422. Modified plans, for a draw span instead of a lifting span, approved Apr. 28, 1899, 99, 619.

MISSOURI RIVER, SIBLEY, MO. (Sp.)

(Kansas City, Topeka & Western R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 88, 308, 2435.

Legislation.

Bridge authorized by act of July 3, 1884, 88, 2434.

Plans.

In 1887 Lt. Col. Suter reported that the bridge would not form any obstruction to navigation, 88, 2436.

MISSOURI RIVER, SIOUX CITY, IOWA. (Sp.)

(Sioux City & Pacific R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Reports, **83**, 271, 1603.

ENGINEER IN CHARGE. Maj. C. R. Suter, 1882.

Legislation.Bridge authorized by act of Aug. 15, 1876, **78**, 1094.Bridge authorized by act of June 27, 1882, **83**, 271.**Plans.**Maj. Suter reported if the bridge be located and built as projected it would form no unnecessary obstruction to navigation, **83**, 1603.**MISSOURI RIVER, SIOUX CITY, IOWA. (Sp.)**

(Sioux City Bridge Co.)

Engineers.CHIEF OF ENGINEERS. Report, **88**, 309.**Legislation.**Bridge authorized by act of Aug. 15, 1886, **88**, 2477.**Plans.**Dimensions of proposed bridge, **88**, 2476.Lt. Col. Suter reported the proposed span of 400 f., with a treadway of 50 f., amply sufficient for the requirements of navigation, **88**, 2477.**MISSOURI RIVER, SIOUX CITY, IOWA. (Sp.)**

(Pacific Short Line Bridge Co.)

Engineers.CHIEF OF ENGINEERS. Report, **90**, 338.**Legislation.**Authorized by act of Mar. 2, 1889, **90**, 338.**Plans.**Plan and location submitted, and approved by Secretary of War June 26, 1890, **90**, 338.**MISSOURI RIVER, NEAR MOUTH OF KANSAS RIVER, BETWEEN WYANDOTTE COUNTY, KANS., AND CLAY COUNTY, MO. (Sp.)**

(Missouri River & Land Improvement & Construction Co.)

Engineers.CHIEF OF ENGINEERS. Report, **91**, 432.

ENGINEER IN CHARGE. Lt. Col. C. R. Suter.

Legislation.Company authorized to construct bridge by acts of Oct. 12, 1888, and Feb. 6, 1890, **91**, 432.**Plans.**Plans submitted Oct. 12, 1889; not conforming to the act of Oct. 12, 1888, were not approved. Plans submitted Feb. 7, 1890, and Jan. 24, 1891; reported upon adversely by the Missouri River Commission; not approved. Amended plans submitted Mar. 2, 1891; approved June 4, 1891. **91**, 432.**MISSOURI RIVER, YANKTON, S. DAK. (Sp.)**

(Yankton Bridge Co.)

Engineers.CHIEF OF ENGINEERS. Reports, **94**, 425; **97**, 529.

ENGINEER IN CHARGE. Capt. H. F. Hodges, 1894.

Legislation.

Company authorized to construct bridge

by act of June 22, 1892. Amending act, May 28, 1894. **94**, 425.**Plans.**Approved Aug. 3, 1894, **94**, 425. Subsequently plans for lengthening of two north end main spans approved Sept. 11, 1896. Plans in lieu of the last approved Nov. 23, 1896. **97**, 529.

MOBILE BAY AND MISSISSIPPI SOUND, ACROSS SHOAL WATER BETWEEN, CEDAR POINT TO DAUPHIN ISLAND, ALA. (Sp.)

(Mobile & Dauphin R. R. & Harbor Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 465.

ENGINEER IN CHARGE. Maj. A. N. Damrell.

Legislation.

Construction authorized by act of Sept.

26, 1890. Amending act, Feb. 28, 1893. 93, 465.

Plans.

Plans submitted Sept. 10, 1892, approved Aug. 21, 1893, 93, 465.

MOKELUMNE RIVER, SOUTH FORK, NEW HOPE LANDING, CAL. (S.)

(San Joaquin County, Cal.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 469.

ENGINEER IN CHARGE. Maj. W. H. Heuer.

Plans..

Approved March 24, 1893. Completion of bridge reported on June 30, 1893. 93, 469.

MONONGAHELA RIVER. (See Ohio River, etc.)

MONONGAHELA, ALLEGHENY, AND AT THE LOWER END OF THE MUSKINGUM RIVERS. (A.)

Engineers.

ENGINEER IN CHARGE. Lt. Col. W. E. Merrill. Report, 88, 2566.

Plans.

Tabular statement of all bridges, with dimensions thereof, over the navigable por-

tions of the Monongahela and Allegheny rivers, 88, 2566, 2568.

Bridges on the Monongahela and Allegheny requiring modification, 88, 2567, 2569.

MONONGAHELA RIVER, BETWEEN BRADDOCK AND MIFFLIN TOWNSHIPS, PA. (Sp.)

(Braddock & Duquesne Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 530.

Legislation.

Company authorized to construct bridge by act of Jan. 26, 1897, 97, 530.

Plans.

Approved Apr. 10, 1897, 97, 530.

MONONGAHELA RIVER, ELIZABETH, PA. (Sp.)

(West Elizabeth Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 464.

ENGINEER IN CHARGE. Lt. Col. A. Stickney.

Legislation.

Company authorized to construct bridge by act of Feb. 15, 1893, 93, 464.

Plans.

Submitted June 17, 1892; modified Aug. 25, 1892, and Feb. 28, 1893; approved Mar. 18, 1893, 93, 464.

MONONGAHELA RIVER, NEAR FAIRMONT, W. VA.**Engineers.**

CHIEF OF ENGINEERS. Report, 85, 293, 1923.

Plans.

Referred to Lt. Col. Merrill for examination and report, 85, 293, 1920. Recommended that site and plans be approved, provided that one channel-span be arranged with opening of 220 f. and a clear

height of 41½ f., 85, 1922. Clear span reduced to 140 f., 85, 1924; and the recommendation made and approved by Secretary of War that the bridge company be permitted to build at a less height than that above indicated, provided they should subsequently raise the bridge if required, 85, 1924.

MONONGAHELA RIVER, BETWEEN HOMESTEAD AND PITTSBURG, PA. (Sp.)

(Braddock & Homestead Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 473.
ENGINEER IN CHARGE. Maj. R. L. Hoxie.

Legislation.

Company authorized to construct bridge by act of June 7, 1894, 95, 473.

Plans.

Plans submitted July 26, 1894, proved unsatisfactory to navigation interests; modified plans approved Sept. 20, 1894, 95, 473.

MONONGAHELA RIVER, McKEESPORT, PA. (Sp.)

(Mifflin Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 531.

Legislation.

Company authorized to construct bridge by act of Feb. 25, 1897, 98, 531.

Plans.

Modified plans approved Feb. 24, 1898, 98, 531.

MONONGAHELA RIVER, BETWEEN MIFFLIN AND RANKIN, PA. (AT CARRIE FURNACES). (Sp.)

(Union R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 697.

Legislation.

Company authorized to construct

bridge by act of Mar. 2, 1900, 1900, 697.

Plans.

Approved Mar. 10, 1900, 1900, 697.

MONONGAHELA RIVER, MONONGAHELA CITY, PA. (Sp.)

(Pittsburg, Monongahela & Wheeling R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 422.

Legislation.

Company authorized to construct bridge by act of Mar. 2, 1895, 96, 422.

Plans.

Approved Sept. 12, 1895, 96, 422.

MONONGAHELA RIVER, NEAR FERRY STREET, PITTSBURG, PA. (Sp.)

(Pittsburg & Mansfield R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 423.

Legislation.

Company authorized to construct bridge by act of Mar. 2, 1895, 96, 423.

Plans.

Approved May 20, 1896, 96, 423.

MONONGAHELA RIVER, PITTSBURG, PA. (Sp.)

(Glenwood Highway Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 474.

ENGINEER IN CHARGE. Maj. R. L. Hoxie.

Legislation.

Company authorized to construct bridge by act of Apr. 2, 1894, 95, 474.

Plans.

Approved Nov. 3, 1894; reported completed, 95, 474.

MONONGAHELA RIVER, SOUTH 10TH STREET, PITTSBURG, PA. (S.)

(Birmingham & Pittsburg Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 477.

Maj. R. L. Hoxie.

mitted July 20, 1894; unsatisfactory to navigation interests; modified plans approved Oct. 22, 1894, 95, 477.

Plans.

Plans for reconstruction of bridge sub-

MONONGAHELA RIVER, SOUTH 22D STREET, PITTSBURG, PA. (Sp.)

(Pittsburg city bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 426.

ENGINEER IN CHARGE. Capt. R. L. Hoxie.

Plans.

Plans submitted May 25, 1894, modified Aug. 3, 1894; approved Aug. 21, 1894, 94, 426.

Legislation.

City authorized to construct bridge by act of May 7, 1894, 94, 426.

MONONGAHELA RIVER, PITTSBURG, PA. (Sp., etc.)

(South 22d Street Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 403.

ENGINEER IN CHARGE. Maj. D. W. Lockwood.

under act of Sept. 19, 1890, sec. 7, and act of Pennsylvania, 92, 403.

Plans.

Modified plan approved Dec. 26, 1891, 92, 403.

Legislation.

Company authorized to construct bridge

MONONGAHELA RIVER, NEAR PITTSBURG, PA. (Sp.)

(The Upper Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 432.

ENGINEER IN CHARGE. Lt. Col. W. E. Merrill.

under act of Sept. 19, 1890, sec. 7, and act of Pennsylvania, 91, 432.

Plans.

Modified plans approved Aug. 21, 1891, 91, 432.

Legislation.

Company authorized to construct bridge

MONONGAHELA RIVER, NEAR 30TH STREET, SOUTH SIDE, PITTSBURG, PA. (S.)

(Monongahela Connecting R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Plans for an additional span for a Y to the existing bridge approved Apr. 9, 1898, 98, 535.

**MONONGAHELA RIVER, BETWEEN PITTSBURG AND
HOMESTEAD, PA. (Sp.)**

(Homestead & Pittsburg Bridge Co.)

Engineers.CHIEF OF ENGINEERS. Report, 93,
465.ENGINEER IN CHARGE. Lt. Col. A.
Stickney.**Legislation.**Construction authorized by act of Feb.
14, 1893, 93, 465.**Plans.**Modified plans approved May 24, 1893,
93, 465.**MONUMENT RIVER, BETWEEN PORT PERRY AND MIFFLIN
TOWNSHIPS, PA. (Sp.)**

(Union R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, 97,
529.**Legislation.**Company authorized to construct
bridge by act of Jan. 26, 1897, 97, 529.**Plans.**Plans for bridge in lieu of those sub-
mitted Oct. 2, 1896, for bridge between
Mifflin and Wilkins townships, submit-
ted Jan. 30, 1897; modified Feb. 23, 1897;
approved Mar. 8, 1897, 97, 529.**MONONGAHELA RIVER, RANKIN, PA. (Sp.)**

(West Braddock Bridge Co.)

Engineers.CHIEF OF ENGINEERS. Reports, 96,
424; 97, 533.**Legislation.**Company authorized to construct
bridge by act of Apr. 21, 1894, 96, 424.**Plans.**Approved July 20, 1896, 96, 424.
Specified modified plans submitted Dec.
3, 1896; approved Dec. 21, 1896, 97, 533.**MONUMENT AND BLACK RIVERS, BOURNE, MASS. (S.)**

(Town bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 534.

Plans.

Approved July 3, 1897, 97, 534.

MORMON CHANNEL, STOCKTON, CAL. (S.)

(San Francisco & San Joaquin Valley R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 424.

Plans.

Approved Sept. 10, 1895, 96, 424.

MORMON CHANNEL, OTTER STREET, STOCKTON, CAL. (S.)

(City bridge.)

Engineers.CHIEF OF ENGINEERS. Report, 95, 476.
ENGINEER IN CHARGE. Maj. W. H.
Heuer.**Plans.**Approved Sept. 17, 1894. Plans chang-
ing the location, approved Jan. 7, 1895.
Bridge completed. 95, 476.**MORSE AND SPRAGUE RIVERS, PHIPPSBURG, ME. (S.)**

(Town bridges.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 621.

Plans.

Approved Jan. 18, 1899, 99, 621.

**MOUNT PLEASANT AND SULLIVANS ISLAND, COVE
BETWEEN, S. C. (S.)**
(Charleston & Sea Shore R. R. Co.)

Engineers.	Plans.
CHIEF OF ENGINEERS. Report, 98, 536.	Approved June 7, 1898, 98, 536.

MUD RIVER, AT OR NEAR ROCHESTER, KY. (S.)
(Butler & Muhlenburg counties' bridge.)

Engineers.	Plans.
CHIEF OF ENGINEERS. Report, 98, 533.	Approved Oct. 2, 1897, 98, 533.

**MURDERERS (MOODNA) CREEK, NEAR MOUTH, CORNWALL,
ORANGE COUNTY, N. Y. (O.)**
(Railroad bridge.)

Engineers.	was requested, July 23, 1889, to take action as prescribed by law, 89, 377.
CHIEF OF ENGINEERS. Report, 89, 377.	
Legislation.	Plans.
As the railroad company failed to comply with requirements of notice, the Attorney-General of the United States	Alterations required by July 1, 1889; no action taken, 89, 377.

MURDERERS CREEK, N. Y. (O.)

Engineers.	Legislation.
CHIEF OF ENGINEERS. Report, 90, 342.	Notice served as to alterations required, 90, 342.

MUSKEGON LAKE, MICH. (S.)
(North Muskegon bridge.)

Engineers.	Plans.
CHIEF OF ENGINEERS. Report, 93, 468.	Submitted Feb. 15, 1892, approved Mar. 1, 1893, 93, 468.
ENGINEER IN CHARGE. Maj. W. Ludlow.	

MUSKINGUM RIVER. (See *Monongahela River; Ohio River, etc.*)

MUSKINGUM RIVER, OHIO. (O.)

Engineers.	Legislation.
CHIEF OF ENGINEERS. Report, 90, 341.	Notice served as to alterations required, 90, 341.

**MUSKINGUM RIVER, BETWEEN BEVERLY AND WATER-
FORD, OHIO. (O.)**
(County bridge.)

Engineers.	Plans.
CHIEF OF ENGINEERS. Report, 89, 376.	Alterations required by Sept. 30, 1889, 89, 376.

MUSKINGUM RIVER, OVER LOWELL CANAL, OHIO. (O.)
(County bridge.)

Engineers.	Plans.
CHIEF OF ENGINEERS. Report, 89, 377.	Alterations required by Nov. 1, 1889, 89, 377.

MUSKINGUM RIVER, MARIETTA, OHIO. (Sp.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 620.

Legislation.

City authorized to construct bridge under act of Apr. 2, 1888, 99, 620.

Plans.

Public hearing held; plans approved Aug. 11, 1899, 99, 620.

MUSKINGUM RIVER, MARIETTA, OHIO. (A.)

(Baltimore & Ohio Southwestern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 481.

ENGINEER IN CHARGE. Lt. Col. A. Stickney.

Plans.

Proceedings were instituted against the company, under act of Aug. 11, 1888 (amending act, Sept. 19, 1890), requiring a suitable draw-span opening. Company failed to alter bridge; alteration was required to be completed by Oct. 31, 1891;

time extended to July 1, 1892; order revoked Feb. 6, 1893. 95, 481.

Act of Aug. 17, 1894, required changes, to be paid by the United States. In accordance therewith Col. Stickney submitted plans for pivot pier; approved June 4, 1895; superstructure of the draw to be completed by the Railway Co. 95, 481.

(See *Muskingum River, Ice Harbor at mouth of*, 96, 277.)

MUSKINGUM RIVER, BETWEEN MARIETTA AND HARMAR, OHIO. (O.)

(Baltimore & Ohio Southwestern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 434.

Plans.

Specified alterations required on or be-

fore Oct. 31, 1891; time extended to Jan. 1, 1892, 91, 434.

MUSKINGUM RIVER, MUSKINGUM, MICH. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 468.

ENGINEER IN CHARGE. Maj. W. Ludlow.

Plans.

Submitted Feb. 19, 1892; approved Mar. 11, 1893, 93, 468.

MUSKINGUM RIVER, STOCKPORT, OHIO. (Sp.)

(Morgan County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 372.

Legislation.

County authorized to construct bridge by act of Apr. 2, 1888, 89, 372.

Plans.

Approved Aug. 14, 1888. On June 3,

1899, it was discovered that the pivot pier of the draw span had been located 10 f. west of position in the approved drawings; the adopted location approved June 15, 1899, 89, 372.

MUSKINGUM RIVER, TAYLORSVILLE, OHIO. (A.)

(Muskingum County bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 91, 434; 95, 482.

Plans.

In Jan., 1890, bridge a probable obstruction upon completion of lock No. 9, at Taylorsville; under act of Aug. 11, 1890, notices were served for a suitable draw-span to be completed by Sept. 30, 1891. Legal proceedings were instituted against the commissioners, which resulted in a verdict for defendant. 91, 434; 92, 2004, 2006.

Act of Aug. 17, 1894, required changes to be made to conform to the accommodation of commerce and improvement of the river, using public funds; superstructure of the draw to be built by the county commissioners. 95, 482.

Lt. Col. Stickney submitted plans for pivot pier and guide cribs; approved June 12, 1895, 95, 482.

(See *Muskingum River, Lock at Taylorsville, Ohio*, 96, 277.)

MUSKINGUM RIVER, ZANESVILLE, OHIO. (Sp.)

(County.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 336.

Legislation.

Authorized by act of Apr. 2, 1888, 90, 336.

Plans.

Plans and location submitted, and approved by Secretary of War Aug. 5, 1889, 90, 336.

MUSKINGUM RIVER, CANAL AT FOOT OF MAIN STREET, ZANESVILLE, OHIO. (O.)

(Muskingum County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 434.

Plans.

Specified alterations required on or before Dec. 1, 1891; time extended to Dec.

1, 1892, to be then further extended or abandoned if Government work of constructing lock and dam No. 11 be not commenced, 91, 434.

MUSKINGUM RIVER, OVER CANAL AT ZANESVILLE, OHIO.

(Muskingum County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 377.

Plans.

Alterations required by Nov. 1, 1889, 89, 377.

MUSKINGUM RIVER, FIFTH STREET, ZANESVILLE, OHIO. (O.)

(Muskingum County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 377.

Plans.

Alterations required by Nov. 1, 1889, 89, 377.

MYSTIC RIVER (MALDEN BRIDGE), BOSTON, MASS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 99, 623; 1900, 700.

Plans.

Reconstruction plans approved Aug. 12, 1899, 99, 623.

Plans for temporary bridge, during construction of permanent bridge, approved Nov. 4, 1899; alternate plans submitted Jan. 13, 1900, approved Jan. 30, 1900, 1900, 700.

MYSTIC RIVER (CHELSEA BRIDGE), BOSTON, MASS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 478.
ENGINEER IN CHARGE. Lt. Col. S. M. Mansfield.

Plans.

Plans for reconstruction of draw span approved May 4, 1895, 95, 478.

MYSTIC RIVER, BETWEEN BOSTON AND CHELSEA (CHELSEA BRIDGE), MASS. (S.)

(Boston city bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 698.

Plans.

Reconstruction plans for the draw, and

plans for a temporary bridge for use during reconstruction of permanent bridge, approved Sept. 7, 1899, 1900, 698.

Plans for north extension of draw pier approved June 29, 1900, 1900, 698.

MYSTIC RIVER, MASS. (S.)

(Lynn & Boston R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 478.
ENGINEER IN CHARGE. Lt. Col. S. M. Mansfield.

Plans.

Plans for temporary bridge approved May 21, 1895, 95, 478.

MYSTIC RIVER, BOSTON, MASS. (S.)

(Lynn & Boston R. R. Co., temporary bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 469.
ENGINEER IN CHARGE. Lt. Col. S. M. Mansfield.

Plans.

Approved Apr. 13, 1893, 93, 469.

NAPA RIVER, NAPA, CAL. (Sp., etc.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 410.
ENGINEER IN CHARGE. Lt. Col. W. H. H. Benyaurd.

under act of July 13, 1892, sec. 3, and act of California, 92, 410.

Plans.

Plans for new bridge approved Sept. 6, 1892, 92, 410.

Legislation.

City authorized to construct bridge

NARRAGUAGUS RIVER, MILBRIDGE, ME. (Sp., etc.)

(Town bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 407.
ENGINEER IN CHARGE. Lt. Col. P. C. Hains.

Plans.

Alteration plans for the "Great Bridge" approved July 7, 1892, 92, 407.

Legislation.

Town authorized to alter bridge under act of Sept. 19, 1890, 92, 407.

NAVIGABLE WATERS OF THE UNITED STATES, BRIDGING.(See also *Topical Index.*)**Commerce.**

List of bridges, and of bridges authorized over the Mississippi River, **73**, 575. List of appropriations for rivers and harbors in Mississippi Valley, and for all rivers and harbors, **73**, 576. All bridges are obstructions, **74**, 585. Right of way belongs to navigation, and draws should stand open when not in use, **74**, 586. Agriculture the only industry not protected by the government, but rather injured by the overproduction stimulated by the homestead land policy; the only help is cheap transportation, **74**, 608. General requirements of western river navigation, **78**, 926. Statement of losses by collision with the piers of bridges on the Ohio River, **71**, 429. Signals at draws, plan for, **73**, 583; **78**, 723; objections to, **73**, 585.

Power of Congress to protect, **82**, 1980. List of bridges on Upper Mississippi which impede commerce, **82**, 1981.

Importance of coal interests on the Ohio River and the requirements of its commerce, **82**, 2005.

Obstruction to navigation on Chippewa River, Wis., from existing bridges, **82**, 1811.

Dimensions of coal and grain tows on the Mississippi River, **88**, 2380, 2381.

Testimony before the Board in regard to dimensions of tows and desirable dimensions of channel spans, **88**, 2397, 2398, 2400, 2404, 2406, 2408, 2409, 2410.

Engineers.

CHIEF OF ENGINEERS. Reports, **88**, 307, 2371; **1900**, 40.

BOARDS OF ENGINEERS. Report of board of 1888, relative to construction of certain bridges across the Missouri, Mississippi, and Illinois rivers. Reports, **88**, 2374 (Lt. Col. Suter, and Maj. Mackenzie, Miller, and Handbury); **88**, 2383 (Lt. Col. Suter and Maj. Miller).

Constituted by S. O. No. 7, Feb. 3, 1900, to consider and report upon the House Bill 1065, 56th Congress, 1st sess., "to authorize the construction of bridges across the Ohio, Monongahela, Mississippi, Great Kanawha, Tennessee, Cumberland and Illinois rivers, and prescribe the dimensions of the same." Report, **1900**, 5103. (Lt. Col. M. B. Adams, Maj. C. F. Powell, J. H. Willard, W. H. Bixby, and D. C. Kingman; and Capt. H. F. Hodges and E. Burr.)

General considerations.

Object, to secure interests of navigation, **73**, 559. Number of bridges can not be limited, nor their details controlled, except as regards needs of navigation, **73**, 559. Drawbridges *v.* high

bridges discussed by Maj. Warren, **73**, 560. General subjects of concession to railroads discussed by Board of Engineers, **73**, 574. Bad results to navigation from legislation, such as that authorizing bridge at Kansas City, discussed by Capt. Suter, **69**, 306. Discussion of the greatest length of span practicable, by Maj. Warren, **78**, 1063, 1065. Names and dimensions of the largest boats on the Mississippi River, **78**, 929. Discussion on headway required under bridges on the Mississippi River, **78**, 934. Grades and curvatures upon bridges and approaches, **79**, 149, 1461. Maj. Warren's report on bridging the Mississippi River, **76**, 900-1125. List of bridges authorized on the Missouri River but not built, **78**, 1088. List of bridges on the Ohio, **78**, 1086. List of bridges on the Mississippi River from St. Paul, Minn., to St. Louis, Mo., **78**, 1028.

Of navigation through bridges over Upper Mississippi River, **82**, 1979.

Power of Congress to protect navigation, **82**, 1980.

Necessity for changes in laws relating to bridges across the Ohio River, **82**, 1813, 2002.

General considerations at special localities, **80**, 199, 1849; **81**, 267, 2009; **82**, 262, 1989; **83**, 271, 1591; **84**, 269, 1769; **85**, 292, 1917; **86**, 369, 2111; **87**, 337, 2613.

Legislation. (See *Boards of Engineers*).

By Wisconsin and Minnesota authorizing bridges over navigable part of Wisconsin, Mississippi, and Minnesota rivers, **73**, 558. No authority from Congress for three bridges over the Mississippi at Hastings and St. Paul, **73**, 568. Authority of Congress required before War Department can authorize or forbid the construction of a bridge, **76**, ii, 298. Passage for highways to be a part of all bridges built after act of June 4, 1872, **73**, 565, 569; not so considered by Attorney-General, **73**, 570. Abstracts of debates in Congress attending the legalization of bridges across the Mississippi River, **78**, 1041. Decisions of U. S. Supreme Court relating to damages, **78**, 1079. Riprap considered as an obstruction to navigation on the Ohio, H. Doc. 41, 43d Cong., 2d sess. Amendment of existing laws proposed by Board of Engineers for construction of bridges over the Ohio, **71**, 454, 455. Act of Congress July 11, 1870, constituting Board of Engineers for examination of bridges on the Ohio, **71**, 426. Abstract of laws for bridging the Ohio, Mississippi, and Missouri rivers, **78**, 1088.

ACTS OF CONGRESS.

Act of July 25, 1866, partially described,

NAVIGABLE WATERS OF THE UNITED STATES, BRIDGING—Continued.

69, 309; described, 73, 555; compared in full with act of Apr. 1, 1872, 73, 561.

Act of Feb. 21, 1868, described, 73, 555.

Act of Apr. 1, 1872, described, 73, 555; compared in full with act of July 25, 1866, 73, 561.

Act of June 4, 1872, 73, 563.

Necessity of legislation relating to bridges over the Upper Mississippi River, 82, 1979.

Consideration of a proposed act to prescribe the dimensions of bridges across the Ohio River, 82, 2001.

Defects in present laws relating to bridges across the Ohio River, 82, 2008.

Amendatory act proposed for Ohio River, 82, 2010.

Necessity for general law applying to bridges over navigable waters, 82, 1813.

Bill authorizing the construction of bridges across the Missouri, Mississippi,

and Illinois rivers, and prescribing the character, location, and dimensions of the same, 88, 2384.

Draft of the bill authorizing construction of bridges across the above-named rivers, 1900, 5117.

Plans.

Dimensions of spans and drawopenings, as fixed by the Board of 1888, for bridges over the Mississippi, Missouri, and Illinois rivers, 88, 2372-2373.

Projects.

Decisions of Board of Engineers, 1900, 1900, 5104.

Surveys.

MAPS. Made by Maj. Warren of surveys for bridges over the Mississippi River, 72, 817; 78, 1128.

NECHES RIVER, BEAUMONT, TEX. (S.)

(Texarkana & Fort Smith Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 531.

Plans.

Approved Sept. 12, 1896, 97, 531.

NEUSE RIVER, N. C. (S.)

(Wilmington & Weldon R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 477.

ENGINEER IN CHARGE. Maj. W. S. Stanton.

Plans.

Approved Dec. 17, 1894, 95, 477.

NEUSE RIVER, GOLDSBORO, N. C.

(Wilmington & Weldon R. R. Co.)

Plans.

Capt. Bixby recommended that the bridge be permitted to remain in its con-

dition, provided the owners should clear away the obstructing portion of the old pier beneath, 88, 2545.

NEUSE RIVER, KINGSTON, N. C.

(Atlantic & North Carolina R. R. Co.)

Engineers.

ENGINEER IN CHARGE. Capt. Bixby

reported the bridge no obstruction to navigation, 88, 2545.

NEUSE RIVER, NEWBERN, N. C. (S.)

(Craven County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Modified plans approved Mar. 22, 1898, 98, 535.

NEW HAVEN, CONN. (See *Coscob*, etc.)

NEWTON CREEK, GREENPOINT AVENUE, NEW YORK, N. Y.
(S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 536.

Plans.

Reconstruction plans approved June 17, 1898, 98, 536.

NEWTON CREEK, BETWEEN LONG ISLAND CITY AND BROOKLYN, N. Y. (A.)

(Bridges of Kings and Queens counties.)

Engineers.

CHIEF OF ENGINEERS. Reports, 95, 481; 97, 535; 98, 537.

ENGINEER IN CHARGE. Lt. Col. G. L. Gillespie, 1895.

Plans.

Proceedings instituted against the

bridge at Manhattan ave. (Vernon ave.); alteration plans, together with plans for a temporary bridge, approved May 7, 1895, 95, 481. Revised plans approved Nov. 21, 1898, 97, 535. Alteration plans approved June 3, 1898, 98, 537.

NEWTON CREEK, MEEKER AVENUE, BROOKLYN, N. Y. (O.)

(Kings and Queens counties bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 411.

Plans.

Specified alterations to drawbridge required on or before Oct. 1, 1892, 92, 411.

NEWTON CREEK, BETWEEN VERNON AND MANHATTAN AVENUES, NEW YORK, N. Y. (O.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 538.

Plans.

Specified alterations to be completed June 30, 1899, 98, 538.

NEW MEADOWS RIVER, BETWEEN BRUNSWICK AND WEST BATH, ME. (S.)

(Lewiston, Brunswick & Bath Street Ry. bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Approved May 23, 1898, 98, 535.

NIAGARA RIVER, BUFFALO, N. Y. (S. and Sp.)

(Grand Trunk Ry. Co., international bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 70, 218; 71, 49; 99, 619.

BOARD OF ENGINEERS. Convened at Buffalo Oct. 3, 1870, submitted preliminary report, and adjourned awaiting information from bridge company and New York canal officers, 71, 219. Reconvened at Washington Jan. 28, 1871; reported, approving location and plan, with certain modifications. Report, 71, 219. Ap-

proved by Secretary of War, 71, 218. (Majs. Warren, Merrill, and Harwood.)

Legislation.

Company authorized to construct bridge by acts of June 30, 1870, and June 23, 1874, 71, 49, 219; 99, 619. Legislation suggested by Board of Engineers, 71, 221.

Plans.

Described, 71, 219.

Reconstruction plans of the superstructure approved Mar. 29, 1899, 99, 619.

NIAGARA RIVER, GRAND ISLAND, NEAR BUFFALO, N. Y.
(Sp.)

(Niagara River Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 619.

bridge by act of June 29, 1898, 99, 619.

Legislation.

Company authorized to construct

Plans.

Approved June 2, 1899, 99, 619.

NIAGARA RIVER, LEWISTON, N. Y. (Sp.)

(Lewiston Connecting Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 532.

Plans.

Approved Aug. 11, 1898, 98, 532.

Legislation.Company authorized to construct bridge
by act of May 22, 1896, 98, 532.**NOOKSACK RIVER, FERNDALE, WASH. (Sp., etc.)**

(Whatcom County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 408; 93, 468.

under act of Sept. 19, 1890, sec. 7, and
act of Washington, 92, 408.ENGINEER IN CHARGE. Capt. T. W.
Symons, 1892, 1893.**Plans.**Approved Aug. 4, 1892, 92, 408; modified
plans approved Feb. 25, 1893, 93, 468.**Legislation.**

County authorized to construct bridge

NOOKSACK RIVER, LYDEN, WASH. (Sp., etc.)

(Whatcom County bridge.)

Engineers.CHIEF OF ENGINEERS. Report, 92, 408.
ENGINEER IN CHARGE. Capt. T. W.
Symons.under act of Sept. 19, 1890, sec. 7, and
act of Washington, 92, 408.**Plans.**

Approved Aug. 4, 1892, 92, 408.

Legislation.

County authorized to construct bridge

NOOKSACK RIVER, ORVIS FERRY, WASH. (S.)

(Whatcom County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 534.

Plans.

Approved Feb. 17, 1898, 98, 534.

NORTH MENOMONEE CANAL, SIXTEENTH STREET, MILWAUKEE, WIS. (S.)

(City bridge.)

Engineers.CHIEF OF ENGINEERS. Report, 93, 470.
ENGINEER IN CHARGE. Maj. J. F.
Gregory.**Plans.**

Approved July 29, 1893, 93, 470.

NORTONS CREEK, HEMPSTEAD, QUEENS COUNTY, N. Y. (S.)

(Hempstead City bridge.)

Engineers.CHIEF OF ENGINEERS. Report, 94, 427.
ENGINEER IN CHARGE. Lt. Col. H. M.
Robert.**Plans.**Approved Feb. 6, 1894. Reported
completed, 94, 427.

NORWALK HARBOR (OR RIVER), SOUTH NORWALK, CONN.
(S.)

(New York, New Haven & Hartford R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 478.

ENGINEER IN CHARGE. Col. H. M. Robert.

Plans.

Approved April 4, 1895, 95, 478.

OAKLAND HARBOR, ALICE AND HARRISON STREETS, ALAMEDA, CAL. (O. and A.)

(Southern Pacific Co. and Central Pacific R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 96, 428; 97, 535.

Plans.

Alteration: A draw in bridge at Alice street of not less than 150 f. clear opening, to be operated by other than hand

power and to be completed within 15 months from May 28, 1896, 96, 428.

In lieu of above orders, plans for a new bridge at Harrison street, to replace structure at Alice street, approved Apr. 30, 1897, 97, 535.

OAKLAND HARBOR, WEBSTER STREET, ALAMEDA, CAL.
(O. and A.)

(Alameda County bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 96, 428; 98, 538.

Plans.

Alteration: A draw of not less than 150 f. clear opening, to be operated by other

than hand power, and to be completed within 15 months from May 29, 1896, 96, 428. Alteration plans in accordance with above requirements submitted Apr. 15, 1898; approved Aug. 11, 1898, 98, 538.

OCEANPORT, N. J. (See *Shrewsbury River*.)

OCHLOCKONEE RIVER, MCINTYRE, FLA. (O.)

(Carabelle, Tallahassee & Georgia R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 431.

Plans.

Removal of the row of piles from center

of one of the open spans, to afford a clear opening of 32 f., to be completed on or before June 1, 1894; work completed, 94, 431.

OCMULGEE RIVER, ABOVE HAWKINSVILLE AND BELOW MACON, GA. (O.)

(East Tennessee, Virginia & Georgia R. R.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 343.

ENGINEER IN CHARGE. Capt. R. L. Hoxie. Report, 88, 2552.

Legislation.

Notices served as to alterations required, 90, 343.

Plans.

Capt. Hoxie recommended the insertion of 60-f. draws in each bridge, 88, 2552.

OCMULGEE RIVER, NEAR LUMBER CITY, GA. (O.)

(East Tennessee, Virginia & Georgia Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 377.

Plans.

Alterations required by Aug. 1, 1889, 89, 377.

OCMULGEE RIVER, MACON, GA. (Sp., etc.)

(Macon, Dublin & Savannah R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 406.

ENGINEER IN CHARGE. Capt. O. M. Carter.

Legislation.

Company authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Georgia, 92, 406.

Plans.

Approved July 5, 1892, 92, 406.

OCONEE RIVER, GA. (O.)**Engineers.**

CHIEF OF ENGINEERS. Report, 90, 344.

Legislation.

Notice served as to alterations required, 90, 344.

OCONEE RIVER, DUBLIN, GA. (Sp.)

(Macon, Dublin & Savannah R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 430.

ENGINEER IN CHARGE. Lt. O. M. Carter.

Legislation.

Company authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Georgia, 91, 430.

Plans.

Approved Jan. 27, 1891, 91, 430.

OCONEE RIVER, ABOVE DUBLIN, GA. (A.)

(Central R. R.)

Engineers.

ENGINEER IN CHARGE. Capt. R. L. Hoxie. Report, 88, 2552.

Plans.

Capt. Hoxie recommended the insertion of a draw with 60 f. clear span, 88, 2552.

OCONEE RIVER, AT OR NEAR DUBLIN, GA. (Sp.)

(Lawrence County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 369.

ENGINEER IN CHARGE. Capt. R. L. Hoxie.

Legislation.

County authorized to construct bridge by act of June 18, 1888, 89, 369.

Plans.

Approved Aug. 17, 1888, 89, 369.

OCONEE RIVER, NEAR DUBLIN, GA. (Sp.)

(Wrightsville & Tennille (Tennville) R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 429.

ENGINEER IN CHARGE. Lt. O. M. Carter.

Legislation.

Company authorized to construct bridge by act of May 21, 1890, 91, 429.

Plans.

Approved Nov. 17, 1890, 91, 429.

OGEECHEE, ALTAMAHA, AND SATILLA RIVERS, GA. (S.)

(Florida Central & Peninsular R. R. Co.—on the line of its Savannah extension.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 468.

ENGINEER IN CHARGE. Capt. O. M. Carter.

Plans.

Approved Feb. 21, 1893, 93, 468.

OHIO RIVER.

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 40.

BOARD OF ENGINEERS. On House bill No. 1065, 56th Congress, 1st session, "To authorize the construction of bridges across the Ohio, Monongahela, Mississippi, Kanawha, Tennessee, Cumberland, and Illinois rivers, and to prescribe the dimensions of the same." Report, 1900, 5102. (Lt. Col. M. B. Adams, Maj. C. F. Powell, Maj. J. H. Willard, Maj. W. H. Bixby, Maj. D. C. Kingman, Capt. H. F. Hodgess, and Capt. E. Burr.)

ENGINEER IN CHARGE. Lt. Col. G. K. Warren, 1879. Report, 79, 1463.

Projects.

Principal features and cost of the following bridges:

Steubenville R. R.
Wheeling (highway).
Bridgeport (highway).
Bellaire R. R.
Parkersburg R. R.
Newport and Cincinnati R. R. (as commenced).
Newport and Cincinnati R. R. (as altered).
Covington & Cincinnati (highway).
Louisville R. R.
Paducah R. R.

OHIO RIVER, BEAVER, PA.

Engineers.

CHIEF OF ENGINEERS. Reports, 78, 110 891, 895; 80, 199, 1849; 84, 269, 1787; 87, 338, 2659.

BOARDS OF ENGINEERS:

Convened at Pittsburg, Pa., Aug., 1877. Recommendation, 78, 894. Report, 78, 892. Approved by Chief of Engineers and Secretary of War, 78, 895, 896. (Col. Simpson, Majs. Weitzel and Merrill.)

Convened in 1883 to examine questions at issue with a view of avoiding legislation, 84, 269. Bridge an obstruction to navigation; failure to effect satisfactory arrangements with the company for the correction of the evil, 84, 1786; 87, 2655. (Lt. Cols. Craighill and Weitzel and Maj. Mackenzie.)

Legislation.

Executive requirements, 80, 199, 1849; 87, 2655.

Plans.

Proposed by R. R. company; modification of, by Board of Engineers, 78, 894.

Railroad company required to build in connection with the bridge a dike for the protection of navigation, 80, 199, 1849. Maj. Merrill reported that such dike not built, 80, 1849. Department of Justice decided that the United States powerless to compel R. R. company to build dike, 80, 1852. Subsequent changes of opinion, 84, 1787, 1788; 87, 2655.

Survey.

MAP. Location of bridge, 78, 892.

OHIO RIVER, BEAVER, PA. (Sp.)

(Pittsburg & Lake Erie R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 371.

Legislation.

Company authorized to construct bridge under act of Dec. 17, 1872, 89, 371.

Plans.

Submitted Nov. 26, 1888, to rebuild a part of the superstructure approved Mar. 25, 1889, on specified conditions, which were accepted by the company Feb. 28, 1889, 89, 371.

OHIO RIVER, BELLAIRE, OHIO. (Sp.)

(Railroad.)

Commerce.

Serious accident by collision with piers, 71, 403, 411. Losses by collision with piers, \$60,500, 71, 411, 429.

Engineers.

BOARD OF ENGINEERS. Recommended, 1870, no change, and commended the excellent manner of construction, 71, 411. Report, 71, 408, 425. (Majs. Warren, Weitzel, and Merrill.)

Legislation.

Bridge authorized by act of July 14, 1862, 71, 408. Act of July 11, 1870, constituting Board of Engineers, 70, 67; 71, 61, 426.

Plans.

Description of bridge, 71, 408.

OHIO RIVER, BETWEEN BELLAIRE, OHIO, AND BENWOOD, W. VA. (Sp.)

(Bellaire-Benwood Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 531.

BOARD OF ENGINEERS. 1897.

Legislation.

Plans referred to Board of Engineers, as required by act of Feb. 14, 1883, sec. 4., 98, 531.

Plans.

Plans submitted Feb. 16, 1897. Board of Engineers recommended, Apr. 23, 1897, a channel span 800 f. long and 90 f. above l. w.; modified plans in accordance submitted Apr. 22, 1898; approved May 26, 1898, 98, 531.

OHIO RIVER, CAIRO, ILL. (Sp.)

Commerce.

Dimensions of Ohio River steamers, 86, 2121. Protests of commercial interests against the bridge, 86, 2130.

Engineers.

CHIEF OF ENGINEERS. Report, 86, 369, 2127.

BOARD OF ENGINEERS. Board reported adversely to a draw and recommended a clear headway of 53 f. above high water, 86, 2127. (Lt. Cols. Abbot and Poe, and Majs. Mackenzie and Allen.)

Legislation.

Authorized by acts of Dec. 17, 1872, and Feb. 14, 1883, 86, 370.

Plans.

Plan proposed by bridge company considered inadmissible by Board of Engineers, 86, 2127. Recommendations of the Board of Engineers, 86, 2127. Concurred in by the Chief of Engineers.

OHIO RIVER, BETWEEN CHESTER, W. VA., AND EAST LIVERPOOL, OHIO. (Sp.)

(East Liverpool Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 94, 425; 96, 422.

BOARD OF ENGINEERS. 1894.

ENGINEER IN CHARGE. Lt. Col. A. Stickney.

Legislation.

Authorizing acts: Dec. 17, 1872, and Feb. 14, 1883, 94, 425.

Plans.

Plans submitted May 11, 1894, for 500 f. span, referred to a Board of Engineers, which recommended 650 f. in the clear. Modified plans approved July 2, 1894, 94, 425.

Company reorganized; modified plans approved Sept. 3, 1895, 96, 422.

OHIO RIVER, CINCINNATI, OHIO. (Sp.)

Commerce.

Method of towing, 76, ii, 303.

Coal interests, 76, ii, 303, 304.

Chamber of Commerce committee, Report of, 76, ii, 304.

Engineers.

CHIEF OF ENGINEERS. Reports, 76, 92, ii, 298, 306, 307. Approved modified plan as proposed by board, 76, ii, 307. Approved by the Secretary of War, 76, ii, 308.

BOARD OF ENGINEERS. Convened at

Cincinnati, Ohio, Aug., 1874. Disapproved of location unless width of channel space be increased to 500 f., 76, ii, 299, 305. Additional cost of span, \$75,000, 76, ii, 306. Report, 76, ii, 300. (Col. Simpson, Majs. Merrill and Suter.)

Legislation.

Bridge authorized by act of Dec. 17, 1872, 76, ii, 299.

Plans.

Description of proposed bridge, 76, ii, 302.

OHIO RIVER, CINCINNATI, OHIO. (Sp.)

(Newport & Cincinnati Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 93, 464; 95, 475.

ENGINEER IN CHARGE. Lt. Col. A. Stickney.

Legislation.

Original construction authorized by act of Mar. 3, 1871. The general laws of Dec. 17, 1872, and Feb. 14, 1883, required larger channel clearance. 93, 464.

Plans.

Feb. 15, 1893, plans submitted for recon-

struction by widening but not altering the dimensions of the channel span. Lt. Col. Stickney recommended the company be required to rebuild according to the existing law. The company's plans approved Mar. 6, 1893. 93, 464.

April 30, 1895, the Pennsylvania R. R. Co., controlling the bridge, submitted new plans for a greater height and length of channel span and to be in lieu of the old plans; approved May 21, 1895, 95, 475.

OHIO RIVER, BETWEEN CINCINNATI, OHIO, AND COVINGTON, KY. (Sp.)

Engineers.

CHIEF OF ENGINEERS. Reports, 87, 337, 2613.

BOARD OF ENGINEERS. Reports of Board of 1886, 87, 2616, 2621.

Legislation.

Bridge authorized by act of May 20, 1886, 87, 337.

Plans.

The Board of Engineers of 1886 disapproved the location of the bridge, 87, 337. Approval of changed location and plan, 87, 337, 2631.

OHIO RIVER BETWEEN CINCINNATI, OHIO, AND COVINGTON, KY. (Sp., etc.)

(Cincinnati & Covington Rapid Transit Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 407.

ENGINEER IN CHARGE. Maj. A. Stickney.

Legislation.

Company authorized to construct bridge

by acts of Dec. 17, 1872 and Feb. 14, 1883, 92, 407.

Plans.

Plans referred to Board of Engineers, modified plans based upon report of board approved July 27, 1892, 92, 407.

OHIO RIVER, BETWEEN CINCINNATI, OHIO, AND NEWPORT, KY.

(Central R. R. & Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 88, 309, 2482.

BOARD OF ENGINEERS. Convened at Cincinnati, Mar. 17, 1888, by S. O. No. 11, to examine and report upon plans and location of proposed bridge across the Ohio River between Cincinnati, Ohio, and Newport, Ky. Report, 88, 2483. (Lt. Col. Poe and Majs. Stickney and Mackenzie.)

Legislation.

Authorized by acts of Dec. 17, 1872, and Feb. 14, 1883, 88, 2480.

Plans.

Description of proposed bridge, 88, 2482.

The Board of 1888 recommended the approval of the plans and location of proposed bridge as set forth by the Central R. R. & Bridge Co., 88, 2484.

OHIO RIVER BELOW CEREDO, W. VA. (Sp.)

(West Virginia & Iron-ton R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 337.

Legislation.

Authorized by acts of Dec. 17, 1872, and Feb. 14, 1883, 90, 337.

Plans.

Plan and location submitted; approved by Secretary of War, Dec. 24, 1889, 90, 337.

OHIO RIVER, NEAR THE MOUTH OF CORKS RUN. (Sp.)

(Ohio Connecting R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **88**, 309, 2498, 2504, 2506.BOARD OF ENGINEERS. Convened at Washington, June 25, 1887, by S. O. No. 60, to consider and report upon plans for the proposed bridge across the Ohio river, about 1 mile below the junction of the Allegheny and Monongahela rivers, submitted by the Ohio Connecting Railroad Co. Report, **88**, 2499. (Lt. Cols. Merrill and Barlow, Maj. Stickney, and Lt. Spencer.) Second report of Board, **88**, 2505. (Lt. Cols. Merrill and Barlow, and Maj. Stickney.)**Legislation.**Bridge authorized by acts of Dec. 17, 1872, and Feb. 14, 1883, **88**, 2498.**Plans.**The Board of 1887 recommended that the site selected by the bridge company be accepted on condition that the axis of the bridge be changed to lie at right angles to the line of the current, and that the channel space be increased to 800 f.; but that otherwise the site be rejected, **88**, 2502.Revised plans approved by the Board on October 4, 1887, **88**, 2506.**OHIO RIVER, COVINGTON, KY. (S. and Sp.)**

(Suspension.)

Engineers.BOARD OF ENGINEERS. Recommended, 1870, no changes, **71**, 416, 419. Report, **71**, 414, 454. (Majs. Warren, Weitzel, and Merrill.)**Legislation.**

First charter granted by Kentucky

February, 1846; confirmed by Ohio March, 1849; amended 1856, **71**, 415. Bridge authorized by Congress Feb. 17, 1865, **71**, 415, 428; **78**, 1089.**Plans.**Description of plans, **71**, 414. Cost of bridge, \$1,480,000, **71**, 419, 425.**OHIO RIVER, EAST CAIRO, KY. (Sp.)**

(Chicago, St. Louis & New Orleans R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **88**, 308, 2437.**Legislation.**Authorized by acts of Dec. 17, 1872, and Feb. 14, 1883, **88**, 2437.**Plans.**Description of proposed bridge, **88**, 2436.**OHIO RIVER, EVANSVILLE, IND.****Engineers.**CHIEF OF ENGINEERS. Reports, **72**, 440; **78**, 110; **79**, 149. Recommended modification of act authorizing construction of of bridges across the Ohio River, **72**, 440.BOARD OF ENGINEERS. Convened at Evansville, Ind., November, 1877; were unable to reach any conclusions for want of high-water surveys, **78**, 110; **79**, 149. (Majs. Warren, Weitzel, and Merrill.)**OHIO RIVER, HENDERSONVILLE, KY. (Sp.)****Commerce.**Requirements of the Ohio River, **82**, 1990.**Engineers.**CHIEF OF ENGINEERS. Reports, **82**, 263, 1989; **86**, 370, 2138, 2140.BOARD OF ENGINEERS. Report, **82**, 1992. (Lt. Col. Comstock, Majs. Weitzel and Merrill.)**Legislation.**Bridge authorized by act of Dec. 17, 1872, **82**, 1990.**Plans.**Description of spans proposed, **82**, 1891. Changes in plan approved by Board of Engineers made without its approval, **86**, 2136, 2139.Modifications subsequently approved, **86**, 2140.Board of Engineers recommended plan submitted by railroad company for approval, **82**, 1992.

OHIO RIVER, LOUISVILLE, KY. (Sp.)

Commerce.

Losses by collision with piers of bridges, \$26,704, 71, 421, 429.

Engineers.

CHIEF OF ENGINEERS. Reports, 82, 263, 1988.

BOARDS OF ENGINEERS. On Ohio River bridges, considered this a first-class structure in all respects, 71, 421. Recommended no changes of location or plan, 71, 421. Report, 71, 119, 454. (Majs. Warren, Weitzel, and Merrill.) Report, 82, 1988. (Lt. Col. Comstock and Majs. Weitzel and Merrill.)

Legislation.

Bridge authorized by act of July 14,

1862, and Feb. 17, 1865, 71, 419, 428; 78, 1089. Act of July 11, 1870, constituting Board of Engineers, 70, 67; 71, 61, 426.

Bridge authorized by act of Dec. 17, 1872, 82, 1986. Requirements of Ohio, 82, 1987.

Plans.

Description of bridge, 71, 419. Cost of bridge, \$1,615,120, 71, 421, 425.

Modification of previous plans, 82, 1986.

Approval of plans by Board of Engineers, 82, 1988.

Board of Engineers recommended that the plans adopted by railroad company be approved, 82, 1988.

OHIO RIVER, BETWEEN LOUISVILLE, KY., AND JEFFERSONVILLE, IND. (Sp.)

(Louisville & Jefferson Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 89, 370; 90, 335.

BOARD OF ENGINEERS.

Constituted by S. O. No. 34, Apr. 19, 1889. Report, 90, 3465 (Col. C. B. Comstock, Lt. Col. C. R. Suter, and Maj. C. J. Allen.)

ENGINEER IN CHARGE. Maj. A. Stickney.

Legislation.

Company authorized to construct bridge under act of Dec. 17, 1872; supplementary act Feb. 14, 1883, 89, 370.

Plans.

Board of Engineers recommended 650 f. span, Indiana side, and 400 f. span, Kentucky side; approved Feb. 28, 1889, 89, 370.

Plans considered by second Board of Engineers, Sept. 14, 1889, 90, 3465. Modified plans approved Oct. 19, 1889; new modification approved Nov. 15, 1889. Substitution of l. w. elevation of 1887 for that of 1889, approved Jan. 29, 1890, 90, 336.

OHIO RIVER, BETWEEN MARIETTA, OHIO, AND WILLIAMSTOWN, W. VA. (Sp.)

(Marietta & Williamstown Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 531.

Legislation.

Company authorized to construct bridge by act of Dec. 17, 1872. Amending act Feb. 14, 1883. 98, 531.

Plans.

Submitted Nov. 2, 1897; modified plans conforming to the requirements of the Board of Engineers submitted June 26, 1898; approved Feb. 4, 1898, 98, 531.

OHIO RIVER, LOUISVILLE AND PORTLAND CANAL. (Sp.)

(Louisville & Portland Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 531.

Plans.

Reconstruction plans approved Mar. 2, 1898, 98, 531.

OHIO, MONONGAHELA, ALLEGHENY, MUSKINGUM, BIG SANDY, GUYANDOT, LITTLE KANAWHA, AND BUCKHANNON RIVERS.

Engineers.

ENGINEER IN CHARGE. Lt. Col. W. E. Merrill. Report, 88, 2672.

ASSISTANT. Lt. L. Beach. Report, 88, 2677.

Plans.

List of bridges, with location, dimensions, and channel span in the clear, on the Ohio, 88, 2673; the Monongahela, 88, 2674; the Allegheny, 88, 2675.

OHIO RIVER, NEVILLE ISLAND, PA., BACK CHANNEL AT THE LOWER END OF. (S.)

(Pittsburg & Lake Erie R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 701.

Plans.

Approved June 12, 1900, 1900, 701.

OHIO RIVER, NEVILLE ISLAND, PA., BACK CHANNEL FROM FLEMING PARK TO HEAD OF. (S.)

(Pittsburg & Lake Erie R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 701.

Plans.

Approved May 16, 1900, 1900, 701.

OHIO RIVER, NEWPORT, KY. (Sp.)**Commerce.**

Losses by collision with piers of bridge, 71, 414, 429. Bridge a serious obstruction to navigation, 71, 431, 447. Commerce greatly increasing, 71, 434, 448.

Engineers.

CHIEF OF ENGINEERS. Reports, 71, 61.

BOARD OF ENGINEERS. Constituted by act of July 11, 1870, 70, 67; 71, 61, 426. Discussion of the various acts relating to the Newport and Cincinnati bridge, 71, 431, 432, 435. Proposed modifications, 71, 452. Estimated cost, \$288,605, 71, 452, 453. Modified plan of bridge, approved

by Secretary of War, 71, 61. (Majs. Warren, Weitzel, and Merrill.)

Legislation.

Bridge authorized by acts of July 14, 1862; Mar. 3, 1869, and Mar. 3, 1871, 71, 61, 414, 427, 431, 435, 455; 78, 1086. Act of July 11, 1870, constituting Board of Engineers, 70, 67; 71, 61, 426. Acts relating to bridge referred to, 78, 1090.

Plans.

Of Board of Engineers for increasing height of bridge 28½ f. and removal of drawspan, 71, 452. Description of present bridge, 71, 440.

OHIO RIVER, PADUCAH, KY. (Sp.)

(Proposed.)

Engineers.

BOARD OF ENGINEERS. On Ohio River bridges, recommended that the joint resolution of Apr. 7, 1869, be repealed, and that a general act be passed to regulate the construction of all future bridges over the Ohio River, 71, 424. Copy of proposed act, 71, 455. If built under act

proposed the bridge would not be injurious to navigation, 71, 424. Report, 71, 424, 454. (Majs. Warren, Weitzel, and Merrill.)

Legislation.

Bridge authorized by act of Apr. 7, 1869, 71, 424, 428. Various acts relating to bridge referred to, 78, 1090, 1092.

OHIO RIVER, PARKERSBURG, W. VA. (Sp.)**Commerce.**

Losses by collision with piers of bridge, \$45,900, 71, 414, 429. \$30,000 raised by subscription, 71, 412, 430. List of subscribers, 71, 430. Petition to Congress to be reimbursed to the amount expended, 72, 442.

Engineers.

CHIEF OF ENGINEERS. Recommended that the payment of increased cost caused by change of plan be provided for by the United States in the same manner as for the Newport and Cincinnati bridge, 72, 441, 442.

BOARD OF ENGINEERS. On Ohio River bridges, recommended no change in this bridge, 71, 414. Report, 71, 411, 454. (Majs. Warren, Weitzel, and Merrill.)

Legislation.

Bridge authorized by act of July 14, 1862, 71, 411. Act of July 11, 1871, constituting Board of Engineers, 71, 61, 426.

Plans.

Description of bridge, 71, 411. Cost of bridge, \$1,223,550, 71, 414.

OHIO RIVER, POINT PLEASANT, W. VA.

Engineers.

CHIEF OF ENGINEERS. Report, **82**, 263, 1998.

BOARD OF ENGINEERS. Recommended approval of plans provided channel span be changed to position suggested by coal exchange, and that the lowest part of bridge be at least 40 f. above h. w.,

82, 2000. (Lt. Col. Comstock, Majs. Weitzel and Merrill.)

Plans.

Coal exchange at Pittsburg recommended change of location in piers proposed by the bridge company, **82**, 2000. Modification accepted by company, **82**, 2000.

OHIO RIVER, ROCHESTER, PA. (Sp.)

(Ohio River Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **96**, 422.

Plans.

By act of Feb. 14, 1883, sec. 4, the plans and map were referred to a Board

of Engineers, who recommended they be changed so as to provide a channel span 90 f. above l. w. and 800 f. long; modified plans in accordance approved Nov. 9, 1895, **96**, 422.

OHIO RIVER, SEWICKLEY, PA. (Sp.)

(Coraopolis & Sewickley Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **99**, 620.

Legislation.

Company authorized to construct bridge under act of Dec. 17, 1872; amending act Feb. 14, 1883, **99**, 620.

Plans.

Modified plans conforming to the requirements of the Board of Engineers approved July 11, 1899, **99**, 620.

OHIO RIVER, STEUBENVILLE, OHIO. (Sp.)

(Pittsburg, Cincinnati & St. Louis Ry. Co., successors of the Western Transportation Co.)

Commerce.

Bridge a serious obstruction to navigation, **71**, 402, 403. Losses by collision with the piers, **71**, 403, 429. Bad location of the bridge, **68**, 50, 316. Channel contracted by riprap, **68**, 381.

Engineers.

CHIEF OF ENGINEERS. Reports, **68**, 50; **89**, 369.

BOARD OF ENGINEERS. On Ohio River bridges, considered the Steubenville bridge the most obstructive on the river, **71**, 403. Recommended that the channel span be widened to 424 f., at an estimated cost of \$200,414, **71**, 403, 404. Method of making the changes, **71**, 404. Total cost of present bridge, \$1,000,000, **71**, 425. (Majs. Warren, Weitzel, and Merrill.)

ENGINEER IN CHARGE. Maj. G. K. Warren. Reports, **68**, 316, 380.

Legislation.

Western Transportation Co. authorized to construct bridge by act of July 14, 1862, **71**, 426; **89**, 369. Act of July 11, 1870, constituting a Board of Engineers, **70**, 67; **71**, 61, 426; **78**, 1088.

Plans.

Of Maj. Warren, increasing channel span to 500 f. in width, **68**, 50, 316. Draft of laws required, **68**, 50, 316. Reconstructing channel span for double track during the months of July and Aug., 1889; approved Dec. 22, 1888, **89**, 369.

OHIO RIVER, WHEELING, W. VA. (Sp.)

(Wheeling & Harrisburg Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Reports, **82**, 263, 1994; **84**, 269, 1773.BOARD OF ENGINEERS. Recommended modifications in plans submitted by the bridge company, **82**, 1997.Modifications made and approved by Board, **84**, 1776. (Lt. Col. Comstock, Majs. Weitzel and Merrill.)**Legislation.**Bridge authorized by act of Dec. 17, 1872, **82**, 1992. Supplementary act of Feb. 14, 1883, **84**, 1772.**Plans.**Description of span opening proposed by railroad company, **82**, 1996.Modifications and recommendations of the Board of Engineers, **82**, 1997. Accepted by the bridge company, **82**, 1998. Plans as modified approved by Board of Engineers, **84**, 1776.**OHIO RIVER, WHEELING, W. VA. (Sp.)**

(Wheeling Bridge Co.)

Engineers.CHIEF OF ENGINEERS. Report, **90**, 336.**Legislation.**Authorized by acts of Dec. 17, 1872, and Feb. 14, 1883, **90**, 337.**Plans.**Plan and location submitted, and approved by Secretary of War, Oct. 26, 1889, **90**, 337.**OHIO RIVER, WHEELING, W. VA., TO BRIDGEPORT, OHIO.**

(Sp.)

Engineers.CHIEF OF ENGINEERS. Reports, **70**, 67; **71**, 61.BOARD OF ENGINEERS. On Ohio River bridges, did not recommend any changes in the Wheeling suspension bridge, **71**, 407. Report, **71**, 405, 408. (Majs. Warren, Weitzel, and Merrill.)**Legislation.**Bridge authorized by act of Aug. 3, 1852, **71**, 427. Act of July 11, 1870, consti-tuting Board of Engineers, **70**, 67; **71**, 61, 426. Various acts relating to bridge, referred to, **78**, 1088, 1092.**Plans.**History of the Wheeling Bridge, **78**, 1029. Description of bridge, **71**, 405, 406. Original cost, \$161,594, **71**, 407, 425. Destroyed by a hurricane in 1854; rebuilt at a cost of \$37,000, **71**, 405, 407. Again rebuilt in 1860, at a cost of \$55,000, **71**, 405, 407.**OHIO RIVER, WHEELING, W. VA., TO MARTINS FERRY OHIO. (Sp.)**

(Wheeling & Harrisburg Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **89**, 371.

ENGINEER IN CHARGE. Lt. Col. W. E. Merrill.

Legislation.

Company authorized to construct bridge

by act of Dec. 17, 1872; supplementary act, Feb. 14, 1883, **89**, 371.**Plans.**Original location approved Dec. 10, 1883; amended location submitted Apr. 22, 1889; approved May 18, 1889, **89**, 371.**OLD RIVER, CAL. (S.)**

(San Francisco & San Joaquin Valley Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **99**, 621.**Plans.**Approved Oct. 28, 1898, **99**, 621.

OOSTENLAULA AND COOSAWATEE RIVERS, GA. (A.)

(Two railroad and two county bridges.)

Engineers.

ENGINEER IN CHARGE. Capt. P. M. Price, 1889. Report, 89, 2797.

Plans.

Bridges without a draw, and the piers are too low, 89, 2797.

OSAGE RIVER, OSCEOLA, MO. (S.)

(Kansas City, Osceola & Southern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 531.

Plans.

Approved, Nov. 23, 1896, on condition that the company construct a pivot pier whenever so directed, 97, 531.

OUACHITA AND ARKANSAS RIVERS, CAMDEN AND PINE BLUFF, ARK. (Sp.)

Engineers.

CHIEF OF ENGINEERS. Report, 83, 271, 1606.

Legislation.

Bridge authorized by act of June 27, 1882, 83, 271.

Plans.

Description of, 83, 1605.
Location of bridge 10 miles below point specified in act of June 27, 1882, 83, 1606.

Bridges partly completed before passage of act, 83, 1607. Draw-span openings across Ouachita River only 110 f. in place of 130, as required, 83, 1607. Recommended by Capt. Handbury, that the matter of the length of drawbridge opening be allowed to remain in abeyance, 83, 1609. Approved by Secretary of War, 83, 1610.

OUACHITA RIVER, NEAR COLUMBIA, LA. (Sp.)

(Houston, Central Arkansas & Northern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 430.
ENGINEER IN CHARGE. Capt. J. H. Willard.

by act of Aug. 6, 1888. Amending act, Aug. 18, 1890. 91, 430.

Plans.

Amended plan approved Nov. 25, 1890, 91, 430.

Legislation.

Company authorized to construct bridge

OUACHITA RIVER, DESIARD STREET, MONROE, LA. (Sp.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 97, 530; 98, 531.

Legislation.

City authorized to construct bridge by act of Feb. 8, 1897, 97, 530.

Plans.

Approved July 2, 1897, 97, 530. Plans for construction of timber crib work between Monroe City bridge and the Vicksburg, Shreveport & Pacific Ry. bridge, submitted Sept. 6, 1897; approved Sept. 18, 1897, 98, 531.

PABLO CREEK, FLA. (O.)

(Duval County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 625.

Plans.

Bridge to be raised 3 f., and to have a

25-f. opening on or before Sept. 1, 1899, 99, 625.

PABLO CREEK, FLA. (O.)

(Jacksonville & Atlantic Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 625.

25-f. opening on or before Sept. 1, 1899,
99, 625.**Plans.**

Bridge to be raised 3 f., and to have a

PABLO CREEK, FLA. (O.)

(Jacksonville, Mayport & Pablo Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 625.

25-f. opening on or before Sept. 1, 1899,
99, 625.**Plans.**

Bridge to be raised 3 f., and to have a

PACHECO, ALHAMBRA, AND CODELIA SLOUGHS, CAL. (S.)

(Southern Pacific R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.Reconstruction plans for bridges at these
places approved May 1, 1899, 99, 622.**PAMLICO RIVER, N. C. (A.)**

(One railroad and three county bridges.)

Engineers.ENGINEER IN CHARGE. Capt. W. H.
Bixby, 1889. Report, 89, 2796.**Plans.**A railroad and 3 county bridges slightly
interfere with navigation; would proba-
bly be provided with draws, should com-
merce demand it, 89, 2796.**PAMUNKEY RIVER AND MABSCO CREEK, VA., WHITE
HOUSE. (A.)**

(Richmond & Danville and Alexandria & Fredericksburg R. R. Cos.)

Engineers.ENGINEER IN CHARGE. S. T. Abert,
U. S. agent. Reports, 88, 2621.**Plans.**Draws too narrow, and vessels passing
are swept against the sides, 88, 2621.**PAMUNKEY RIVER, NEW CASTLE FERRY, VA. (S.)**

(King William County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.Modified plans approved May 20, 1899,
99, 622.**PASCAGOULA RIVER, JACKSON COUNTY, MISS. (S.)**

(Mobile, Jackson & Kansas City R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 424.

Plans.

Approved Sept. 10, 1895, 96, 424.

PASSAIC RIVER, N. J. (S.)

(New York Bay R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, 1900,
701.**Plans.**

Approved Mar. 31, 1900, 1900, 701.

PASSAIC RIVER, PASSAIC, N. J. (S.)

(Passaic and Bergen counties bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 428.
ENGINEER IN CHARGE. Capt. T. L. Casey.

Plans.

Plans submitted May 11, 1894; modified May 24, 1894; approved May 31, 1894, 94, 428.

PASSAIC RIVER, NEWARK, N. J. (S.)

(Erie R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 533.

Plans.

Reconstruction plans approved Sept. 16, 1897, 98, 533.

PASSAIC RIVER, RUTHERFORD, N. J. (S.)

(Bergen and Passaic counties bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 427.

Plans.

Modified plans approved Aug. 14, 1896, 96, 427.

PATUXENT RIVER, MOUNT CALVERT, NEAR BRISTOL LANDING, MD. (S. and Sp.)

(Washington & Chesapeake Beach Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 92, 405; 94, 428.

ENGINEER IN CHARGE. Maj. C. E. L. B. Davis, 1892, 1894.

Legislation.

Company authorized to construct bridge under act of Sept. 19, 1890, sec. 7, and act of Maryland, 92, 405.

Plans.

Original plan approved Apr. 26, 1892, 92, 405. On Mar. 30, 1894, the company submitted plans for modification in construction of draw and center pier; approved Apr. 3, 1894, 94, 428.

PAW PAW RIVER, MICH. (A.)

(Two R. R. bridges.)

Engineers.

ENGINEER IN CHARGE. Maj. W. Ludlow, 1889. Report, 89, 2802.

Plans.

Two railroad bridges slightly obstruct navigation, 89, 2802.

PAWTUCKET RIVER, R. I. (A.)

(Boston & Providence R. R. Co.)

Commerce.

Obstruction caused by the bridge to commerce of Pawtucket, 88, 2529.

Engineers.

ENGINEER IN CHARGE. Lt. Col. G. H. Elliott. Report, 88, 2529.

Legislation.

Resolution of State legislature, May 29,

1884, appointing a committee to report upon bridges obstructing the river, 88, 2530.

Plans.

Description of the bridge, 88, 2529. Lt. Col. Elliott reported the available draw opening too narrow and that there should be two, 88, 2530.

PAWTUCKET RIVER, PROVIDENCE, R. I. (A.)

Engineers.

ENGINEER IN CHARGE. Lt. Col. G. H. Elliott. Report, 88, 2528.

Legislation.

Act of State legislature, January, 1883, requiring the reconstruction of the bridge

with a swing draw, with openings on each side of 80 f., 88, 2529.

Plans.

New bridge in process of construction, 88, 2529.

PEACE RIVER. (See *Withlacoochee River*.)**PEARL RIVER, MISS. (Sp.)**

(Marion County bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **97**, 530.**Legislation.**County authorized to construct bridge by act of June 18, 1897, **97**, 530.**Plans.**Approved July 1, 1897, **97**, 530.**PENNYPACK CREEK, TORRESDALE AVENUE, PHILADELPHIA, PA. (S.)**

(City bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **94**, 429.

ENGINEER IN CHARGE. Maj. C. W. Raymond.

Plans.Approved June 23, 1894, **94**, 429.**PENSAUKEN CREEK.** (See *Schuylkill River*.)**PEQUONNOCK RIVER, BRIDGEPORT, CONN. (S.)**

(New York, New Haven & Hartford R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **97**, 533.**Plans.**

Plans submitted Apr. 15, 1896, objec-

tionable; modified plans submitted Nov. 10, 1896; approved Dec. 10, 1896, **97**, 533.**PERDIDO RIVER, NEAR HOLMAN FERRY, FLA. AND ALA. (Sp.)**

(Escambia County, Fla., and Baldwin County, Ala., bridge.)

Engineers.CHIEF OF ENGINEERS. Report, **95**, 474.

ENGINEER IN CHARGE. Maj. F. A. Mahan.

Legislation.Counties authorized to construct bridge by act of Aug. 13, 1894, **95**, 474.**Plans.**Approved Dec. 5, 1894. Bridge completed. **95**, 474.**PETIT JEAN, CACHE, ST. FRANCIS, ARKANSAS, SALINE, AND POTEAU RIVERS. (A.)****Engineers.**ENGINEER IN CHARGE. Capt. H. S. Taber. Report, **88**, 2635.**Plans.**Bridges interfere with present or prospective improvement of the streams, **88**, 2635.**PINE LAKE, NEAR CHARLEVOIX, MICH. (Sp.)**

(Chicago & North Michigan R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **91**, 432.

ENGINEER IN CHARGE. Maj. W. Ludlow.

Legislation.

Company authorized to construct bridge

under act of Sept. 19, sec. 7, Michigan laws, and assent of board of supervisors, Charlevoix County, Mich., **91**, 432.**Plans.**Approved Sept. 4, 1891, **91**, 432.

PINE RIVER, ST. CLAIR, MICH. (S.)
(Rapid Ry. Co.)

Engineers. CHIEF OF ENGINEERS. Report, 99, 623.	Plans. Reconstruction plans approved July 3, 1899, 99, 623.
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**PISCATAQUA RIVER, CHANNEL BETWEEN KITTEERY AND
BADGERS ISLAND, ME. (S.)**
(Portsmouth, Kittery & York Street Ry. Co.)

Engineers. CHIEF OF ENGINEERS. Report, 97, 534.	Plans. Approved June 18, 1897, 97, 534.
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PLAQUEMINE BAYOU, LA. (O.)
(Texas & Pacific Ry. Co.)

Engineers. CHIEF OF ENGINEERS. Report, 91, 434.	Plans. Specified alterations required on or before Apr. 15, 1892, 91, 434.
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PLAQUEMINE BAYOU, PLAQUEMINE, LA. (S.)
(Iberville Parish bridge.)

Engineers. CHIEF OF ENGINEERS. Report, 97, 535.	Plans. Approved Aug. 31, 1897, 97, 535.
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POCOMOKE RIVER. (See *Christiana River, Wilmington, Del.*)

**PORTAGE CANAL, CONNECTING FOX AND WISCONSIN
RIVERS NEAR PORTAGE CITY, WIS. (Sp., etc.)** (See *Fox River.*)
(Chicago, Milwaukee & St. Paul Ry. Co.)

Engineers. CHIEF OF ENGINEERS. Report, 92, 403. ENGINEER IN CHARGE. Maj. J. F. Gregory.	Plans. Plans for new bridge approved Jan. 20, 1892, 92, 403.
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**PORTAGE LAKE, BETWEEN HOUGHTON AND HANCOCK,
MICH. (Sp.)**
(Mineral Range R. R. Co.)

Engineers. CHIEF OF ENGINEERS. Reports, 98, 537; 99, 618. Legislation. Company authorized to construct bridge by act of Mar. 3, 1891, 99, 618.	Plans. As-per request in company's letter of Dec. 10, 1897, permission was given, Mar. 1, 1898, to rebuild the drawbridge, 98, 537. Reconstruction plans approved Sept. 15, 1898, 99, 618.
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PORTLAND HARBOR, ME. (See *Fore River mouth.*)

PORTLAND HARBOR, ME. (S.)
(Portland & Cape Elizabeth Ry. Co.)

Engineers. CHIEF OF ENGINEERS. Report, 99, 621.	Plans. Approved Oct. 4, 1898, 99, 621.
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PORTLAND HARBOR, ENTRANCE TO BACK COVE, ME.
(O and A.)

(Portland City bridge ("Turkey's" bridge), highway.)

Engineers.

CHIEF OF ENGINEERS. Reports, 95, 482; 97, 535.

Plans.

Specified alterations required on or before Dec. 31, 1894, but on account of interference with dredging work, time

extended to Dec. 31, 1895, and to Dec. 31, 1896, 95, 482.

Reconstruction plans approved Feb. 10, 1897; modified plans, reducing the draw opening from 70 to 67 f., approved May 28, 1897, 97, 535.

POUTEAU RIVER. (See *Petit Jean River*.)

POTEAU RIVER, CHOCTAW NATION, NEAR FORT SMITH, ARK. (Sp.)

(Fort Smith & Choctaw Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 372.
ENGINEER IN CHARGE. Capt. H. S. Taber.

Legislation.

Company authorized to construct bridge

by acts of June 18, 1888, and Mar. 2, 1889, 89, 372.

Plans.

Approved June 18, 1889, 89, 372.

POTOMAC RIVER. (See *Miscellaneous Index—Part A.*)

POTOMAC RIVER, EASTERN BRANCH OF. (See *Anacostia River*.)

POTOMAC RIVER (AQUEDUCT BRIDGE), GEORGETOWN, D. C.

Engineers.

CHIEF OF ENGINEERS. Report, 76, 66, 331.

ENGINEER IN CHARGE. Maj. W. P. Craighill, 1876. Report, 76, 331.

ASSISTANT. Lt. T. Turtle. Report, 76, 332.

Projects.

Description of bridge, 76, 332.

Surveys.

Examination, with report upon the condition of the Aqueduct bridge over the Potomac River, ordered by the Senate's resolution, Feb. 3, 1876, made, 1876, under direction of Maj. Craighill (report favorable to thorough repair and adjustment), 76, 332.

MAPS. 76, 332.

POTOMAC RIVER, GEORGETOWN, D. C. (Sp.)

(Aqueduct.)

Appropriation.

1886, \$240,000, 88, 789.

Contracts.

1888. C. Thomas, watchman's house and wooden sidewalk construction, \$495 for the first, and \$2.25 per l. f. for the second, 88, 795.

Breen & Feely, embankment construction, 25½ cents per c. y., and slope paving, 45½ cents to \$1.34 per s. y., 88, 795.

Engineers.

CHIEF OF ENGINEERS. Reports on condition of bridge in 1886, 86, 148; 87, 898; 88, 106; 89, 123.

ENGINEER IN CHARGE. Lt. Col. P. C. Hains, 1886-89. Reports, 88, 789; 89, 989.

Legislation.

History of, 86, 931.

Senate resolution of Feb. 25, 1886, calling for an examination of condition of bridge and its safety when the aqueduct is filled with water, 86, 148.

Purchase and reconstruction of bridge authorized by act of June 21, 1886, 88, 789, 790.

Operations.

1887-88. Removal of old and erection of new bridge nearly completed, 88, 792.

1888-89. Reconstruction work completed, 89, 989.

Plans.

General description of, 86, 932.

Condition of bridge in 1886, 86, 933.

Repairs required, 86, 947.

General features of proposed reconstruction, 88, 790.

POTOMAC RIVER, WASHINGTON, D. C. (A.)

(Aqueduct.)

Commerce.

Bridge an obstruction to the commercial interest of the river, **88**, 2541.

Engineers.

ENGINEER IN CHARGE. Maj. P. C. Hains. Report, **88**, 2541.

Plans.

Referred to Maj. Hains for examination and report. Recommended that the use of the bridge as an aqueduct be discontinued, and that a draw be provided. **88**, 2541.

POTOMAC RIVER, GEORGETOWN, D. C.

(Leased by the Alexandria Canal Co.)

Appropriations.

1894, ^a \$51,070, **95**, 4099.

1896, 65,000, **96**, 3886.

Total, 116,070

Contracts.

1894. Shailer & Schniglan Co., repairing bridge, \$33,765, **95**, 4092.

1897. Houston Contracting Co., reconstructing pier No. 4, \$29,997.50, **97**, 3990. Contract annulled May 27, 1898, **98**, 3573.

Engineers.

CHIEF OF ENGINEERS. Reports, **95**, 484; **96**, 424; **97**, 536; **98**, 539; **99**, 626; **1900**, 703.

ENGINEERS IN CHARGE.

Maj. N. Michler, 1868-71. Reports, **68**, 892; **69**, 495; **70**, 518; **71**, 975.

Maj. C. E. L. B. Davis, 1895. Report, **95**, 4085.

Maj. C. J. Allen, 1896-1900. Reports, **96**, 3883, 3887; (Lt. Col.) **97**, 3987; **98**, 3571; **99**, 3777; **1900**, 5123.

Legislation.

Authorized by act of July 27, 1868, **68**, 892.

Operations.

1869. Bridge completed and opened to the public, **69**, 495.

1894-96. Bridge repaired, **95**, 4094; **96**, 3884.

1896-97. Reconstruction of pier No. 4 in progress, **97**, 3988.

1897-98. Reconstruction of pier No. 4 continued, but because of war with Spain work was suspended and contractor requested to block up pier and make bridge as stable as possible. As the contractor refused to comply, the work was done with hired labor. **98**, 3573.

1899-1900. Work in progress on pier No. 4, **1900**, 5124.

Projects.

Maj. Davis estimated, 1893, it would cost \$51,070 to make the necessary repairs to the bridge, **95**, 4090.

Maj. Allen estimated, 1895, it would cost \$65,000 to reconstruct pier No. 4, **96**, 3888.

Surveys.

Examination of the piers of the Aqueduct bridge, with statement of expenditures made since it became joint property of the U. S. and District of Columbia, ordered by the Senate's resolution of Jan. 21, 1893; report made, 1895, by Maj. Davis (see *Projects*), **95**, 4085.

POTOMAC RIVER, GEORGETOWN, ABOUT 3 MILES ABOVE.

(Little Falls Bridge, Chain.)

Engineers.

ENGINEERS IN CHARGE:

Maj. N. Michler, 1867-71. Reports, **67**, 521; **68**, 892; **69**, 495; **70**, 520; **71**, 975.

Maj. O. E. Babcock, 1871-77. Reports, **71**, 969; (Col.), **76**, ii, 690; **77**, ii, 1066.

Operations.

1869. 2 spans rebuilt, 8 others repaired, and minor work done, **69**, 495.

1870-71. Damaged by freshet, 1870, repaired, **71**, 969.

1875-76. Repairs made, **76**, ii, 690.

Projects.

Bridge in a dilapidated condition and only by the most careful attention on the part of the watchman could accidents be avoided, **67**, 521.

Traffic.

Large quantities of produce and thousands of head of cattle reach the Georgetown and Washington markets by this bridge, **68**, 892.

^a District of Columbia.

POTOMAC RIVER, EASTERN BRANCH OF THE. (A.)**Appropriations.**

1887, \$110,000, **87**, 911.
1888, 60,000, **88**, 798.

Total, 170,000

Contracts.

1887. Groton Bridge and Manufacturing Co., bridge construction, \$105,000, **88**, 795.

1890. W. Rothwell, watchman's house, \$333; guard fence, \$1.96 per s. y.; painting through spans, \$549, and wooden sidewalk construction, \$1.10 per l. f., **90**, 1050.

W. H. Mohler, slope paving, \$2 per s. y.; curbing, \$1.48 per l. f.; gutters, 45 cents per s. y., and riprap, 80 cents per c. y., **90**, 1050.

Engineers.

CHIEF OF ENGINEERS. Reports, **87**, 105, 340, 917; **88**, 106; **89**, 123; **90**, 110.

BOARD OF ENGINEERS. Convened by S. O. No. 61, C. of E., 1887, to consider bridging the Eastern Branch of the Po-

tomac River. Report, **87**, 923. (Lt. Col. Wilson and Hains and Maj. Lydecker.)

ENGINEER IN CHARGE. Lt. Col. P. C. Hains, 1887-90. Reports, **87**, 911; **88**, 795, 798; **89**, 990; **90**, 1048.

Legislation.

Alterations in plan of bridge authorized by act of May 14, 1888, **88**, 797.

Operations.

1887-88. Work begun on eastern approach. Operations suspended pending settlement of controversy with Baltimore & Potomac R. R. Co. **88**, 796.

1888-89. Operations resumed under amended plan, **89**, 992, 993.

1889-90. Bridge completed, **90**, 1049.

Projects.

Description of bridge, **87**, 912, 915, 918, 924; **88**, 796.

Surveys.

MAPS. **89**, 992.

POTOMAC RIVER, LITTLE FALLS.

(Iron.)

Appropriations.

1872, \$100,000, **73**, 1159.

Contracts.

1872. R. Dickson, iron bridge (bid within limit of appropriation; contract annulled), **73**, 1159.

1873. Clark, Reeves & Co., bridge, **74**, ii, 392.

Engineers.**ENGINEERS IN CHARGE:**

Col. O. F. Babcock, 1873-77. Reports, **73**, 110, 1159; **74**, ii, 392; **75**, ii, 813; **77**, ii, 1070.

Lt. Col. T. L. Casey, 1880. Report, **80**, 2342.

Col. A. F. Rockwell, 1881-84. Reports, **81**, 2715; **82**, 2738; **83**, 2101; **84**, 2346.

Lt. Col. J. M. Wilson, 1885-86. Reports, **85**, 2509; **86**, 2085.

Operations.

1873. Old wooden span of this bridge removed by Canal Co., **73**, 1159.

1873-74. Bridge constructed, **74**, ii, 392.

1874-75. 1,504 f. hand-rail placed and bridge painted, **75**, ii, 813.

1880. Bridge painted and roadway removed, **80**, 2342.

1881-82. Extensive repairs made, **81**, 2715; **82**, 2738.

1882-83. Guard timbers renewed and painted, **83**, 2101.

1884-86. Repairs made, **84**, 2346; **85**, 2509; **86**, 2085.

POTOMAC RIVER.

(Long Bridge.)

Engineers.**ENGINEERS IN CHARGE:**

Maj. N. Michler, 1867-71. Reports, **67**, 521; **68**, 891; **69**, 495; **70**, 519; **71**, 974.

Maj. O. E. Babcock, 1871. Report, **71**, 969.

Maj. P. C. Hains, 1883-91. Reports, **83**, 783; **84**, 976; **85**, 936; **86**, 886; **87**, 888; (Lt. Col.), **88**, 782; **89**, 986; **90**, 1040, 1042; **91**, 1248.

Maj. C. E. L. B. Davis, 1892. Report, **92**, 1036.

Legislation.

Acts of Feb. 5, 1868, and June 21, 1870, transferred possession of "Long Bridge" to the Baltimore & Potomac R. R. Co., subject to certain conditions, **70**, 519.

Operations.

1868. New draw built and minor repairs made, **68**, 891.

POTOMAC RIVER—Continued.

1869-70. Floor renewed and minor repairs made, **70**, 519.

1870-71. Bridge damaged by a freshet, 1870; reconstructed by company, **71**, 974.

1891-92. Bridge rebuilt, **92**, 1036.

Plans.

Baltimore & Potomac R. R. Co. submitted plans for reconstruction of that part of Long Bridge over Washington channel, approved July 28, 1891, **92**, 1036.

Projects.

Bridge built in 1808. History and description. **67**, 521; **83**, 783; **90**, 1042.

Maj. Hains estimated, 1883, it would cost about \$1,500,000 to rebuild the bridge, **83**, 785.

Bridge a constant menace to Washington during season of ice, **87**, 889.

Lt. Col. Hains estimated, 1890, it would cost \$1,250,000 for separation of the wagon road from the railroad on the north side of the main channel and the reconstruction of the bridge over the main channel of the river on wider spans, **90**, 1044.

Surveys.

Investigation of the desirability of separating the wagon road from the railroad on the north side of the main channel of the Potomac River, with estimate of cost, ordered by Senate's resolution, dated Mar. 7, 1890; report made, 1890, by Lt. Col. Hains (see *Projects*), **90**, 1042.

POTOMAC RIVER, WASHINGTON, D. C. (A.)

(Long Bridge.)

Engineers.

ENGINEER IN CHARGE. Maj. P. C. Hains. Report, **88**, 2539.

Legislation.

First built under act of Feb. 5, 1808, **88**, 2539.

Plans.

Condition of the bridge in 1884. An obstruction to the further improvement of the Potomac River. **88**, 2539.

POTOMAC RIVER, WASHINGTON, D. C.

(Memorial Bridge.)

Appropriations.

1899, \$5,000, **99**, 3779 (survey).

Engineers.

CHIEF OF ENGINEERS. Reports, **86**, 892; **98**, 540; **99**, 42, 627; **1900**, 43, 704.

BOARD OF ENGINEERS. Constituted by S. O. No. 30, Feb. 5, 1900, to consider and report upon the relative merits of the plans submitted for a bridge to be constructed over the Potomac River at Washington, D. C., as a memorial to American patriotism. Report, **1900**, 5127. (Lt. Col. C. J. Allen, Maj. T. W. Symons, Capt. D. D. Gaillard, and S. White and Jas. G. Hill.)

ENGINEERS IN CHARGE:

Maj. P. C. Hains, 1885, 1890. Reports, **86**, 892; (Lt. Col.), **90**, 1045.

Lt. Col. C. J. Allen, 1898-. Reports, **98**, 3573; **99**, 3779; **1900**, 5125.

Physical characteristics.

Description of borings for site of bridge, **98**, 3576.

Projects.

Maj. Hains estimated, 1886, it would cost \$609,543 or \$650,000 to build a bridge over the Potomac River, **86**, 895.

Capt. Symons estimated, 1886, it would cost \$1,000,000 or \$1,500,000 to build a

bridge over the Potomac River from Observatory Hill to Arlington, **86**, 896.

Lt. Col. Hains estimated, 1890, it cost \$3,591,000 to build a suspension bridge at the place designated, **90**, 1047.

Maj. Davis estimated, 1892, it would cost \$803,990 to construct a bridge, plans of which are closely similar to the ones prepared by Col. Hains, 1896, **98**, 3592.

Lt. Col. Allen estimated, 1898, it would cost about \$1,385,000 to build the bridge at the place designated, **98**, 3598.

Description of the main features of the various designs submitted for a memorial bridge, **1900**, 5134-5142.

Board of Engineers, 1900, estimated it would cost \$4,860,000, or 32 per cent more than Mr. Burr's estimate (\$3,680,672), by adopting Mr. Burr's design, with certain recommendations and modifications, for a memorial bridge across the Potomac River, **1900**, 5146.

Surveys.

Examination as to the wisdom of constructing a Government bridge with a suitable draw and approaches, from a point at or near the foot of New York or New Hampshire avenue, on the public grounds, across the Potomac River and Annapolis Island to a point on the United States National Cemetery grounds at Arlington, with estimate of cost, ordered by

POTOMAC RIVER, WASHINGTON, D. C.—Continued.

Senate resolution, May 24, 1886, report made, 1886, by Maj. Hains (see *Projects*), **86**, 893.

Examination in regard to the most suitable kind of bridge from foot of New York avenue across the Potomac River to Arlington, with estimate of cost, ordered by Senate resolution, Feb. 20, 1890, report made, 1890, by Lt. Col. Hains (see *Projects*), **90**, 1045.

Under Senate bill 796, secs. 2 and 3, 52d Cong., 1st sess., Dec. 14, 1891, Maj. Davis was ordered to give his views in reference to the plans and specifications, and submit plan of the proposed bridge between U. S. Naval Observatory grounds and Arlington estate property (see *Projects*), **98**, 3592.

Necessary surveys, soundings, and borings, and securing designs and estimates for a memorial bridge from the most con-

venient point of the Naval Observatory grounds, Washington, D. C., or adjacent thereto, across the Potomac River to the most convenient point of the Arlington estate property, Va., ordered by act of June 4, 1897, made, 1898, by Lt. Col. Allen (report favorable to a further study of the subject; see *Projects*), **98**, 3574.

History of previous examinations for a memorial bridge, **98**, 3590.

Continuing examination for a memorial bridge across the Potomac River, and making or securing designs, calculations, and estimates for same, from the most convenient point of the Naval Observatory grounds or adjacent thereto across the Potomac River to the most convenient point of the Arlington estate property, ordered by act of Mar. 3, 1899, **99**, 3779.

MAPS. **90**, 1046.

POTOMAC RIVER, POWDER MILL BRANCH.

(Wooden bridge.)

Engineers.

ENGINEER IN CHARGE. Lt. Col. T. L. Casey, **78**, 1351.

Operations.

1878. Bridge having been washed away, was towed back and replaced, **78**, 1351.

POTOMAC RIVER, "THREE SISTERS," NEAR WASHINGTON, D. C. (Sp., etc.)

(Washington & Arlington Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **92**, 405.

ENGINEER IN CHARGE. Maj. C. E. L. B. Davis.

Legislation.

Company authorized to construct bridge by act of Feb. 28, 1891, **92**, 405.

Plans.

Approved Apr. 27, 1892, **92**, 405.

POTOMAC RIVER, GEORGETOWN, D. C. (Sp.)

(Proposed.)

Engineers.

CHIEF OF ENGINEERS. Reports, **82**, 263, 2013; **87**, 104, 905.

ENGINEERS IN CHARGE. S. T. Abert, U. S. C. E. Reports, **82**, 2014, 2022, 2027.

Lt. Col. P. C. Hains. Report, **87**, 898.

Legislation.

Bridge authorized by act of Feb. 23, 1881, Congress appropriating \$140,000 therefor, **82**, 2012.

Purchase of Aqueduct Bridge authorized at \$85,000, but found to be impracticable, **82**, 2012, 2018. Recom-

mended legislation, **86**, 931; **87**, 899. Act of June 21, 1886, providing for purchase and reconstruction of bridge, **87**, 899.

Plans.

Location discussed, **82**, 2015, 2023.

Requirements of bridges, **82**, 2024, 2027, 2033.

Proposals received, **82**, 2023, 2026.

Estimates of cost, **82**, 2032.

General description of Aqueduct Bridge completed in 1868, **86**, 932; **87**, 898.

Plans of new bridge, **87**, 902-906.

POTSBURY CREEK, FLA. (O.)

(St. Johns County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 431.

before June 1, 1894, were completed, 94, 431.

Plans.

Specified alterations required on or

POWOW RIVER, BETWEEN AMESBURY AND SALISBURY, MASS. (Sp.)

(Berlin Iron Bridge Co., afterwards committed to the Commissioners of Essex County.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 427.

ENGINEER IN CHARGE. Lt. Col. S. M. Mansfield.

proved Mar. 23, 1889; being unsatisfactory to the city a plan for a leaf draw 35 f. wide was approved Apr. 10, 1889. The Essex County commissioners submitted plan for a pivot draw, instead of the leaf draw, Aug. 25, 1890; approved Sept. 2, 1890. 91, 427.

Plans.

Berlin Iron Bridge Co. submitted plan for draw 56 f. wide, Mar. 11, 1889; ap-

QUINCY BAY, QUINCY, ILL. (S.)

(Chicago, Burlington & Quincy R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 533.

Plans.

Reconstruction plans approved Nov. 20, 1897, 98, 533.

QUINNIPIAC RIVER. (See *Coscob*, etc.)

QUINNIPIAC RIVER, GRAND AVENUE CROSSING, NEW HAVEN, CONN. (O.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 483.

ing, measured at right angles to the channel to be completed on or before Dec. 31, 1896, 95, 483.

Plans.

Requiring a drawspan with 70-f. open-

RACCOON CREEK, N. J. (See *Schuylkill River*.)

RAHWAY RIVER, N. J. (S.)

(Sound Shore R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 426.

Plans.

Modified plans approved Feb. 27, 1896, 96, 426.

RAINY RIVER, MINN. (Sp.)

(Minnesota & Ontario Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. 1900, 699.

bridge by act of Mar. 9, 1900, 1900, 699.

Legislation.

Company authorized to construct

Plans.

Approved June, 22, 1900, 1900, 699.

RANOCAS CREEK, DELANCO, N. J. (S.)

(Burlington County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 701.

Plans.

Reconstruction plans approved June 25, 1900, 1900, 701.

RANCOCAS RIVER, N. J. (See *Schuylkill River*, etc.)**RANCOCAS RIVER, SOUTH (LUMBERTON) BRANCH,
HAINESPORT, N. J. (S:)**

(Burlington County, bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 479.
ENGINEER IN CHARGE. Maj. C. W. Raymond.

Plans.

Plans for reconstruction of bridge approved July 10, 1895, 95, 479.

RANTOWLES CREEK, S. C. (O.)

(Charleston & Colleton counties bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 625.

Plans.

Completion of required alterations reports on Jan. 25, 1899, 99, 625.

RED RIVER, NEAR TEXARKANA, ARK. (Sp.)

(Texarkana & Fort Smith R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 620.

Plans.

Approved Aug. 22, 1899, 99, 620.

Legislation.

Company authorized to construct bridge by act of Jan. 20, 1897, 99, 620.

RED RIVER, AT OR NEAR ALEXANDRIA, LA. (Sp.)

(Shreveport & Red River Valley Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 698.

Plans.

Approved June 15, 1900, 1900, 698.

Legislation.

Company authorized to construct bridge by act of Apr. 12, 1900, 1900, 698.

RED RIVER, UPPER FALLS, NEAR ALEXANDRIA, LA. (Sp.)

(Houston, Central Arkansas & Northern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 430.

Legislation.

BOARD OF ENGINEERS. Constituted by S. O., No. 82, Dec. 1, 1890. (Maj. A. M. Miller, Capt. J. H. Willard, and Capt. H. S. Taber.)

Company authorized to construct bridge by act of Aug. 6, 1888; amending act, Aug. 18, 1890, 91, 430.

Plans.

ENGINEER IN CHARGE. Capt. J. H. Willard.

Amended plan, protests made against the location referred to a Board of Engineers, and upon its recommendation of Dec. 16, 1890, was approved Dec. 29, 1890, 91, 430.

RED RIVER, SHREVEPORT, LA. (A.)**Engineers.**

CHIEF OF ENGINEERS. Report, 87, 339, 2671.

Plans.

Formation of sand bar under draw of bridge an obstruction to navigation. No action taken for its removal by bridge authorities, 87, 339, 2671.

RED RIVER OF THE NORTH, DES MERS AVENUE, GRAND FORKS, DAK. (Sp.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **89**, 370.

ENGINEER IN CHARGE. Maj. C. J. Allen.

Legislation.

City authorized to construct bridge by act of May 21, 1888, **89**, 370.

Plans.

Plans providing for trestlework approach on west side of river, approved Jan. 3, 1889; modification substituting filling for trestlework, approved June 11, 1889, **89**, 370.

RED RIVER OF THE NORTH, MINNESOTA AVENUE, GRAND FORKS, DAK. (Sp.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **89**, 371.

ENGINEER IN CHARGE. Maj. C. J. Allen.

Legislation.

City authorized to construct bridge by

act of May 21, 1888; amending act Mar. 1, 1889, **89**, 371.

Plans.

Approved May 29, 1889, **89**, 371.

RED RIVER OF THE NORTH, DRAYTON, N. DAK. (Sp.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 697.

Legislation.

City authorized to construct bridge by act of Feb. 28, 1900, 1900, 697.

Plans.

Approved Apr. 18, 1900, 1900, 697.

RICE CREEK, FLA. (S.)

(Jacksonville, Tampa & Key West Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **99**, 623.

Plans.

Reconstruction plans approved July 22, 1899, **99**, 623.

RICES POINT, CHANNEL EAST OF, DULUTH, MINN. (A.)

Engineers.

ENGINEER IN CHARGE. Maj. J. B. Quinn, 1889. Report, **89**, 2798.

Ry. Co. encroaching upon the channel, mayor of Duluth notified, but no action taken, **89**, 2798.

Plans.

Pier built by the Eastern Minnesota

RIDLEY CREEK. (See Schuylkill River.)

ROCK CREEK, MASSACHUSETTS AVENUE EXTENDED, WASHINGTON, D. C. (See Potomac River.)

Appropriation.

1897 (survey), \$2,000, **98**, 3624.

Description of proposed bridge, **98**, 3610, 3614, 3616.

Engineers.

CHIEF OF ENGINEERS. Report, **98**, 541.

ENGINEER IN CHARGE. Capt. D. D. Gaillard, 1898. Report, **98**, 3606.

Surveys.

Plans and estimates of cost of erecting a stone arch bridge, and also a steel bridge with stone foundations, over Rock Creek on the line of Massachusetts avenue extended, the full width of said avenue, ordered by act of Mar. 3, 1897, made, 1897, by Capt. D. D. Gaillard (see *Projects*), **98**, 3606.

Projects.

Capt. Gaillard estimated, 1897, it would cost \$568,545 for the stone arch bridge, and \$199,204 for the steel bridge, **98**, 3612, 3622.

ROCK CREEK, PENNSYLVANIA AVENUE, WASHINGTON, D. C.(See *Potomac River*.)

(Bridge No. 6, iron.)

Engineers.**CHIEF OF ENGINEERS.** Report, 77, 124.

BOARD OF ENGINEERS.^a Constituted by S. O. No. 8, dated Feb. 2, 1877, to examine into the propriety of certain modifications of the Rock Creek bridge, convened at Washington, Feb. 7 and at New York, Apr. 7, 1877. Report, 77, ii, 1099. (Col. Z. B. Tower, Lt. Col. H. G. Wright and Q. A. Gillmore.)

ENGINEERS IN CHARGE:

Maj. N. Michler, 1867-70.

Col. O. E. Babcock, 1873-77. Reports, 73, 1166; 74, ii, 400; 75, ii, 815; 76, ii, 694; 77, ii, 1095.

Lt. Col. T. L. Casey, 1877-79. Reports, 77, ii, 1103; 78, 1351; 79, 1885.

Col. G. H. Elliot, 1892-94. Reports, 92, 3361; 93, 4290; 94, 3203.

Maj. J. G. D. Knight, 1895. Report, 95, 4105.

Capt. D. D. Gaillard, 1896-97. Reports, 96, 3914; 97, 3999.

Capt. T. A. Bingham, 1898. Report, 98, 3630.

Lt. Col. A. M. Miller, 1899-. Reports, 99, 2785; 1900, 5196.

ASSISTANT. T. B. Samo. Reports, 67, 550; 68, 909; 69, 506; 70, 525.

Legislation.

Authority requested, 1873, by Col. Babcock to prevent further use of bridge No. 6 over Rock Creek as a thoroughfare, except for use of pedestrians, and the cars of the Washington & Georgetown R. R., for such time to enable them to build a bridge for their railroad, 73, 1166.

Act of Mar. 3, 1875, provided for removal, within one year from Mar. 2, 1875, of the Washington & Georgetown R. R. from bridge No. 6, 75, ii, 815, 816.

Operations.

1867. Bridge No. 6 scraped and painted and some ornamental pieces, which had become detached, were replaced, 67, 550.

1867-68. Newsidewalk built and masonry abutments repaired, 68, 909.

1869-75. Bridge painted and floor repaired, 69, 506; 75, ii, 815.

1878-80. Bridge repaired, 78, 1351; 79, 1885; 80, 2345.

1892-93. Wooden superstructure renewed, 93, 4290.

1893-94. Bridge painted, 94, 3203.

1894-95. Bridge repaired, 95, 4105.

1895-96. New floor placed in bridge, 96, 3914.

1898-99. Bridge painted, 99, 3785.

1899-1900. Floor renewed and bridge painted, 1900, 5196.

Projects.

Col. Babcock estimated, 1876, it would cost \$70,000 to alter the Rock Creek bridge, 76, ii, 694; 77, ii, 1098.

Description of bridge No. 6, 77, ii, 1096, 1099.

Col. Casey estimated, 1877, it would cost \$75,000 to alter the road and foot way over Rock Creek bridge, 77, ii, 1104.

Surveys.

MAPS. 77, ii, 1100.

ROCK RIVER, MOLINE, ILL. (O.)

(City bridge.)

Engineers.**CHIEF OF ENGINEERS.** Report, 96, 428.**Plans.**

Alterations required within six months from May 22, 1895. New hearing was granted, pending which the time of com-

pletion expired. New notice served requiring alteration to be made in one of the three methods described and be completed on or before Aug. 31, 1896. 96, 428.

ROUGE RIVER, DELRAY, MICH. (S.)

(Detroit & Lime Northern Ry. Co.)

Engineers.**CHIEF OF ENGINEERS.** Report, 98, 534.**Plans.**

Modified plans approved Nov. 26, 1897, 98, 534.

^a Quartermaster-General M. C. Meigs (designer and builder of Rock Creek bridge) resents criticisms. Letters, 77, ii, 1093.

ROUGE RIVER, NEAR DETROIT, MICH. (S.)

(Wabash R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 468.

ENGINEER IN CHARGE. Maj. W. Ludlow.

Plans.

Plans for new bridge submitted Nov. 3,

1892, approved Feb. 16, 1893, on condition that the old bridge and central pier be removed, 93, 468.

ROUGE RIVER, DIX AVENUE, MICH. (O.)

(Ecorse and Springwells townships' bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 702.

Plans.

Bridge to be removed or provided with

a draw of 85 f. on or before May 15, 1900, 1900, 702.

ROUGE RIVER, FORT STREET, MICH.

(Ecorse and Springwells townships' bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 700.

Plans.

Plans for new bridge approved Jan. 5, 1900, 1900, 700.

ROUGE RIVER, RIVER ROAD CROSSING, WAYNE COUNTY, MICH. (S.)

(Ecorse and Springwells townships' bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 480.

ENGINEER IN CHARGE. Lt. Col. G. J. Lydecker.

Plans.

Approved Aug. 27, 1895, on condition that a channel be dredged through one of the draw passages to communicate with the river channel above and below, 95, 480.

SACRAMENTO RIVER, BALLS FERRY, SHASTA COUNTY, CAL. (S.)

(County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 533.

Plans.

Approved Dec. 8, 1896, 97, 533.

SACRAMENTO RIVER, BUTTE CITY, CAL. (A.)

Engineers.

ENGINEER IN CHARGE. Capt. A. H. Payson. Report, 88, 2653.

Plans.

Bridge, if built at the locality contemplated, would form a serious obstruction to navigation, 88, 2652.

SACRAMENTO RIVER, BUTTE CITY, CAL. (S.)

(Glenn County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 467.

ENGINEER IN CHARGE. Maj. W. H. Heuer.

Plans.

Approved Jan. 4, 1893; completion of bridge reported on June 22, 1893, 93, 467.

SACRAMENTO RIVER, COLUSA, CAL. (S.)

(Colusa County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Reconstruction plans approved July 20, 1899, 99, 623.

SACRAMENTO RIVER, SACRAMENTO, CAL. (S.)

(California Pacific R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, 95, 479.
ENGINEER IN CHARGE. Maj. W. H. Heuer.**Plans.**

Reconstruction plans approved June 11, 1895, 95, 479.

SACRAMENTO RIVER, TEHAMA, CAL. (O. and A.)

(Southern Pacific Co. and Central Pacific R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 96, 428; 98, 537.

Plans.

Specified alterations to be completed on or before Dec. 31, 1898, 96, 428. Plans approved Feb. 23, 1898, 98, 537.

SAGINAW RIVER, NEAR BAY CITY, BAY COUNTY, MICH. (S.)

(Interurban Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 425.

Plans.

Modified plan and map of new location approved Jan. 15, 1898, 96, 425.

SAGINAW RIVER, BAY CITY, MICH. (S.)

(Detroit & Mackinac Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 426.

Plans.

Approved Feb. 18, 1896, 96, 426.

SAGINAW RIVER, BRISTOL STREET, SAGINAW, MICH. (A.)

(Central Bridge Co.)

Engineers.CHIEF OF ENGINEERS. Report, 95, 480.
ENGINEER IN CHARGE. Lt. Col. G. J. Lydecker.

was an obstruction to navigation, permission was given the company to allow the construction; approved Nov. 16, 1894, to remain temporarily on condition that all obstructions be removed by the opening of spring navigation, and the bridge be reconstructed by that time, 95, 480.

Plans.

Bridge was damaged by cyclone in Sept., 1894, and repaired without lawful authority; complaint being made that the bridge

SAGINAW RIVER, COURT STREET, SAGINAW, MICH. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 534.

Plans.

Approved Mar. 2, 1898, 98, 534.

ST. AUGUSTINE CREEK. (See Ashley River.)**ST. CLAIR LAKE, NORTHWEST CORNER, MICH. (S.)**

(Rapid R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 534.

Plans.

Plan of embankment, trestle and draw-bridge, approved Jan. 25, 1898, 98, 534.

ST. CROIX RIVER, STILLWATER, MINN. (S.)

Commerce.

Bridge would not materially obstruct navigation, **76**, ii, 315.

Engineers.

CHIEF OF ENGINEERS. Reports, **76**, ii, 92. Approved recommendations of Maj. Farquhar, **76**, ii, 313.

Legislation.

Bridge authorized by Minnesota, **76**, ii, 315.

Plans.

Description of bridge, **76**, ii, 315. Maj. Farquhar recommended that the bridge be raised 2 f. Report, **76**, ii, 315. Approved by the Secretary of War, **76**, ii, 314.

ST. CROIX RIVER, WIS. AND MINN. (Sp.)

(Chippewa Falls & Western Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **84**, 270.

Legislation.

Authorized by act of Apr. 28, 1884, **84**, 270.

Plans.

Approved May 8, 1884, **84**, 271.

ST. CROIX RIVER, OSCEOLA, WIS. (Sp.)

(Village bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **96**, 422.

Legislation.

Village authorized to construct bridge by act of Mar. 2, 1895, **96**, 422.

Plans.

Approved Sept. 12, 1895, **96**, 422.

ST. CROIX RIVER, BETWEEN STILLWATER AND TAYLORS FALLS, WIS. AND MINN. (A.)

Engineers.

ENGINEER IN CHARGE. Maj. C. J. Allen, 1889. Report, **89**, 2798.

Plans.

The booms, piers, and logs of the St.

Croix Boom Co. form obstructions to navigation for weeks, and sometimes months, of the season of navigation, **89**, 2798.

ST. FRANCIS LAKE, NEAR LAKE CITY, ARK. (Sp.)

(Jonesboro, Lake City & Eastern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **98**, 532.

Legislation.

Company authorized to construct bridge by act of June 16, 1898, **98**, 532.

Plans.

Approved Aug. 8, 1898, **98**, 532.

ST. FRANCIS LAKE, AT OR NEAR LAKE CITY, ARK. (Sp.)

(St. Francis Bridge & Turnpike Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **97**, 531.

Legislation.

Company authorized to construct bridge by act of Mar. 6, 1896, **97**, 531.

Plans.

Approved Aug. 24, 1897, **97**, 531.

ST. FRANCIS RIVER. (*See Petit Jean River.*)**ST. FRANCIS RIVER, ARK. (O.)**

(St. Louis, Arkansas & Texas R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Reports, **89**, 377; **90**, 342.**Plans.**Alterations required by Sept. 1, 1889, **89**, 377.Notice served as to alterations required, **90**, 342.**ST. FRANCIS RIVER, BELOW KENNETT, MO. (A.)**

(Paragould Southeastern R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **95**, 481.

ENGINEER IN CHARGE. Lt. W. L. Sibert.

Plans.

The bridge, constructed without authority, being an unreasonable obstruc-

tion, the Attorney-General instituted proceedings, under section 10, act of Sept. 19, 1890, against the company; plans providing for a draw in the bridge approved Mar. 26, 1895, **95**, 481.**ST. JOHNS RIVER, BUFFALO BLUFF, FLA. (Sp., etc.)**

(Jacksonville, Tampa & Key West Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **92**, 407.

ENGINEER IN CHARGE. Maj. J. C. Mallery.

Legislation.

Company authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Florida, **92**, 407.**Plans.**Plans for new bridge approved July 20, 1892, **92**, 407.**ST. JOHNS RIVER, FOOT OF LAKE MONROE, FLA. (S.)**

(Jacksonville, Tampa & Key West Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **93**, 469.

ENGINEER IN CHARGE. Maj. J. C. Mallery.

Plans.Reconstruction plans approved June 1, 1893, **93**, 469.**ST. JOHNS RIVER, PALATKA, FLA. (S.)**

(Jacksonville, St. Augustine & Indian River Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, **95**, 477.

ENGINEER IN CHARGE. Maj. T. H. Handbury.

Plans.Plans for reconstruction of bridge submitted Sept. 1, 1894; modified Sept. 20, 1894; approved Oct. 9, 1894, **95**, 477. **e****ST. JONES RIVER.** (*See Christiana River and—*)**ST. JOSEPH HARBOR, ST. JOSEPH, MICH. (A.)**

(Railway.)

Commerce.Bridge a serious obstruction to navigation, **76**, ii, 317.**Engineers**

BOARD OF ENGINEERS. Convened at St. Joseph, Mich., June 10, 1875. Board

recommend modifications of this bridge, **76**, ii, 317. (Majs. Houston, Gillespie, and Mansfield.)**Plans.**Description of bridge, **76**, ii, 316.

ST. JOSEPH HARBOR, NEAR ENTRANCE, MICH. (A.)
(Chicago & West Michigan Ry.)

Engineers.

ENGINEER IN CHARGE. Maj. W. Ludlow, 1889. Report, 89, 2801.

Plans.

Bridge an obstruction to navigation, 89, 2801.

ST. JOSEPH RIVER, NEAR MOUTH, MICH. (A. and O.)
(Chicago & West Michigan Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 89, 375; 90, 340; 92, 411; 93, 471.

Legislation.

Secretary of War approved May 17, 1889, the recommendation that the alterations being made in the draw, be put to trial, 89, 375.

Plans.

On Dec. 4, 1888, alterations were ordered, and a draw with two openings of

100 f. each constructed. Removal of obstructions in draw, required by Apr. 30, 1889. 89, 375; 90, 340. Removal of obstructions to a depth of 15 f. on or before May 15, 1892, and also construction of an additional draw on or before Nov. 1, 1892, 92, 411. On company's protest, after removal of obstruction, Secretary of War deferred construction of north draw; alterations made in 1888 and 1891, approved Feb. 9, 1893, 93, 471.

ST. JOSEPH RIVER, NEAR ST. JOSEPH, MICH. (A.)
(Railway.)

Engineers.

ENGINEER IN CHARGE. Capt. D. W. Lockwood. Report, 88, 2585.

Plans.

Description of the bridge, 88, 2585. Capt. Lockwood proposed to replace the existing south draw with a pivot draw having clear openings of 100 f., 88, 2586.

ST. JOSEPH RIVER, ST. JOSEPH TO BENTON HARBOR, MICH. (A.)

Engineers.

ENGINEER IN CHARGE. Maj. W. Ludlow, 1889. Report, 89, 2801.

Plans.

Three wooden bridges, more or less an obstruction to navigation, 89, 2801, 2802.

ST. JOSEPH RIVER, MICH. (S.)
(St. Joseph Valley Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 533.

Plans.

Approved Mar. 11, 1897, 97, 533.

ST. LAWRENCE, NEAR HOGANSBURG, N. Y. (Sp.)
(Northern New York R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 531.

Plans.

Approved Aug. 21, 1897, 97, 531.

Legislation.

Company authorized to construct bridge by act of Mar. 2, 1897, 97, 531.

ST. LAWRENCE RIVER, MORRISTOWN, N. Y. (Sp.)
(St. Lawrence Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 94, 425; 95, 476.

ENGINEER IN CHARGE. Capt. S. S. Leach.

Legislation.

Company authorized to construct bridge by act of Feb. 9, 1893, 94, 425.

Plans.

Approved Feb. 6, 1894, 94, 425. Modified plans approved Aug. 29, 1895. 95, 476.

ST. LOUIS RIVER, CONNORS POINT, WIS., TO RICES POINT, MINN. (S.)

(Duluth & Superior Bridge Co., temporary bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 477.

ENGINEER IN CHARGE. Maj. C. B. Sears.

Plans.

Plans for temporary bridge approved Dec. 15, 1894, 95, 477.

ST. LOUIS RIVER, CONNORS POINT, WIS., TO RICES POINT, MINN. (Sp.)

(Duluth & Superior Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 475.

ENGINEER IN CHARGE. Maj. C. B. Sears.

bridge by act of Apr. 24, 1894, amending act Aug. 4, 1894, 95, 475.

Plans.

Approved April 4, 1895, 95, 475.

Legislation.

Company authorized to construct

ST. LOUIS RIVER, DULUTH, MINN., TO SUPERIOR, WIS. (S.)

(Superior Rapid Transit Ry. Co., and the Duluth Street R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 425.

Plans.

Plans for a temporary pile and trestle bridge approved Nov. 23, 1895, 96, 425.

ST. LOUIS RIVER, DULUTH, MINN., TO SUPERIOR, WIS. (S.)

(Superior Rapid Transit Ry. Co., and the Duluth Street Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 97, 533.

Plans.

Plans for a temporary pile and trestle bridge approved Nov. 20, 1896, 97, 533.

ST. LOUIS RIVER, ABOUT 12 MILES ABOVE SUPERIOR, WIS. AND MINN. (Sp., etc.)

(Superior Belt Line & Terminal Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 403.

ENGINEER IN CHARGE. Capt. W. L. Fisk.

Plans.

The Duluth, Red Wing & Southern R. R. Co. relinquished its right, granted by act of Feb. 24, 1891, to the other beneficiary of the act whose modified plans were approved Dec. 26, 1891, 92, 403.

Legislation.

Company authorized to construct bridge by act of Feb. 24, 1891, 92, 403.

ST. LOUIS RIVER, BELOW FOND DU LAC. (A.)**Engineers.**

ENGINEER IN CHARGE. Maj. J. F. Quinn, 1889. Report, 89, 2798.

Plans.

St. Louis Boom Co., maintains a log boom which is an obstruction to navigation, 89, 2798.

ST. LOUIS RIVER, FROM GRASSY POINT, MINN. (O.)

(St. Paul & Duluth Rwy. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 89, 376; 90, 342.

Plans.

Alterations required by Sept. 1, 1889, 89, 376.

Notice served as to required alteration; Attorney-General notified that the alterations were not made in the required time, 90, 342.

ST. LOUIS RIVER, MINN. AND WIS. (Sp.)

(Northern Pacific R. R. Co.)

Engineers.

BOARD OF ENGINEERS. Convened to consider and report upon plan and location of bridge, **85**, 1928. Board recommended approval of plans with following modifications: Omission of open span between the drawspan and Rices Point, and that the company shall construct, whenever required, a draw near the Wisconsin shore. **85**, 1930. (Lt. Col. Poe, Maj. Mackenzie and Allen.)

Legislation.

Bridge authorized by act of Feb. 27, 1873, **85**, 293. Requirements of act, **85**, 1927.

Plans.

Reason for change in location proposed by railroad company, **85**, 1925, 1927.

Plan described as proposed by railroad company, **85**, 1929. Modifications recommended by Board of Engineers, **85**, 1930.

Draw on Wisconsin side subsequently provided for, **85**, 1935.

ST. LOUIS RIVER, WIS. (Sp.)

(Wisconsin & New Duluth Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **96**, 423.

Legislation.

Company authorized to construct bridge by act of Mar. 2, 1895, **96**, 423.

Plans.

Modified plans approved Feb. 27, 1896, **96**, 423.

ST. LUCIE RIVER, FLA. (S.)

(Jacksonville, St. Augustine & Indian River Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **93**, 471.

ENGINEER IN CHARGE. Lt. A. M. D'Armit.

Plans.

Approved Aug. 15, 1893, **93**, 471.

ST. MARYS FALLS CANAL. (See St. Marys River.)

ST. MARYS RIVER, GA. AND FLA. (Sp.)

(Florida Central & Peninsular R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **93**, 464.

ENGINEER IN CHARGE. Capt. O. M. Carter.

Legislation.

Construction authorized Feb. 14, 1893, **93**, 464.

Plans.

Approved Mar. 28, 1893, **93**, 464.

ST. MARYS RIVER AND ST. MARYS FALLS CANAL, AT THE RAPIDS OF THE ST. MARYS RIVER, MICH. (Sp.)

(Sault Ste. Marie Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **88**, 308.

ENGINEER IN CHARGE. Col. O. M. Poe, 1891. Report, **91**, 3869.

Legislation.

Construction authorized by act of July 8, 1882, **88**, 2461. **91**, 3869.

Plans.

Lt. Col. Poe approves of location of bridge as proposed, **88**, 2458.

SAKONNET RIVER, R. I. (See Sakonnet River—Vol. II.)

(Stone Bridge.)

SAKONNET OR SEACONNET RIVER, TIVERTON, R. I. (O.)

(Old Colony R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 474.

Plans.

Specified alterations required on or be-

fore July 1, 1894. On July 1, 1894, further specified alterations required. 93, 474.

SAKONNET RIVER, TIVERTON, R. I. (A. and O.)

(New York, New Haven & Hartford R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 98, 538; 99, 624.

Plans.

Specified alterations to be completed

on or before May 1, 1899, 98, 538. Proceedings were instituted against company; plans in accordance with specified requirements approved Jan. 16, 1899, 99, 624.

SALEM RIVER. (See *Schuylkill River*.)**SALINE RIVER.** (See *Petit Jean River*.)**SALKAHATCHIE RIVER.** (See *Ashley River*.)**SALT RIVER, NEAR WEST POINT, KY. (S.)**

(Louisville, St. Louis & Texas Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 469.

ENGINEER IN CHARGE. Lt. Col. G. J. Lydecker.

Plans.

Modified plans approved May 15, 1893, 93, 469.

SAN BERNARD RIVER, CHURCHILLS FERRY, TEX. (S.)

(Brasoria County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 426.

ENGINEER IN CHARGE. Maj. A. M. Miller.

Plans.

Approved Nov. 7, 1893. Reported completed, 94, 426.

SANDUSKY BAY, OHIO. (Sp., etc.)

(Lake Shore & Michigan Southern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 92, 403; 93, 466.

ENGINEER IN CHARGE. Lt. Col. J. A. Smith, 1892-93.

Legislation.

Company authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Ohio, 92, 403.

Plans.

Original plans approved Jan. 16, 1892, 92, 403. Modified plans approved Nov. 23, 1892, 93, 466.

SAN JOAQUIN RIVER, CAL. (S.)

(Alameda & San Joaquin R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 424.

Plans.

Approved Sept. 23, 1895, 96, 424.

SAN JOAQUIN RIVER, CAL. (S.)
(Central Pacific R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 478.
ENGINEER IN CHARGE. Maj. W. H. Heuer.

Plans.

Plans for reconstruction of bridge submitted Apr. 19, 1895, modified May 7, 1895; approved May 21, 1895, 95, 478.

SAN JOAQUIN RIVER, GARWOOD FERRY CROSSING, CAL. (S.)

(San Joaquin County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 467.
ENGINEER IN CHARGE. Maj. W. H. Heuer.

Plans.

Approved Jan. 3, 1893, 93, 467.

SAN JOAQUIN RIVER, NEAR GRAYSON, CAL. (S.)

(Stanislaus County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 466.
ENGINEER IN CHARGE. Maj. W. H. Heuer.

Plans.

Approved Sept. 29, 1892; completion of bridge reported on June 10, 1893, 93, 466.

SAN JOAQUIN RIVER, HILLS FERRY, CAL. (S.)

(Stanislaus and Merced counties' bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Approved July 27, 1899, 99, 623.

SAN JOAQUIN RIVER, NEAR STOCKTON, CAL. (S.)

(San Francisco & San Joaquin Valley R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 620.

Plans.

Approved Sept. 1, 1898, 99, 620.

SANTEE RIVER, S. C. (A.)

(Northeastern R. R. Co.)

Engineers.

ENGINEER IN CHARGE. Capt. W. H. Bixby. Report, 88, 2548.

drawspan openings of the bridge be provided with suitable fenders, 88, 2548.

Plans.

Capt. Bixby recommended that the

SANTEE RIVER, ABOUT 17 MILES BELOW MOUTH OF CONGAREE RIVER, GA. (S.)

(Manchester & Augusta R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 470.
ENGINEER IN CHARGE. Capt. F. V. Abbot.

Plans.

Approved June 20, 1893, 93, 470.

SATILLA RIVER, GA. (See Ogeechee River.)

SAUGUS RIVER, MASS. (S.)

(Metropolitan Park Commission of Massachusetts.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.

Approved Mar. 16, 1899, 99, 622.

SAUGUS RIVER, BETWEEN SAUGUS AND LYNN., MASS. (S.)

(Lynn & Boston R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 624, 625.

Plans.

Reconstruction plans approved Mar. 14, 1899, 99, 622.

SAVANNAH RIVER. (See *Ashley River.*)**SAVANNAH RIVER, NEAR AUGUSTA, GA. (A and O.)**

(Charleston & Western Carolina Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 99, 624, 625.

Plans, approved June 10, 1899, 99, 624. Specified alterations required on or before Nov. 1, 1899, 99, 625.

Plans.

Plans conforming to specified require-

SAVANNAH RIVER, BELOW AUGUSTA, GA. (O.)

(Port Royal & Augusta Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 435.

Plans.

Specified alterations required on or before Nov. 1, 1891, 91, 435.

SAVANNAH RIVER, NEAR AUGUSTA, GA. (S.)

(Port Royal & Augusta Ry. Co.)

Engineers.CHIEF OF ENGINEERS. Report, 94, 429.
ENGINEER IN CHARGE. Capt. O. M. Carter.

Plans, for protection of this bridge and for training the channel through the drawspan, approved June 20, 1894, 94, 429.

Plans.

Plans for erection of certain structures

SAVANNAH RIVER, BETWEEN HUTCHINSONS ISLAND AND THE MAINLAND, GA. (Sp.)

(Georgia & Alabama Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 619.

Plans.

Approved Mar. 11, 1899, 99, 619.

Legislation.

Company authorized to construct bridge by act of Feb. 2, 1899, 99, 619.

SAVANNAH RIVER, NEAR SISTERS FERRY, EFFINGHAM COUNTY, GA. (Sp.)

(The South Bound R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, 91, 429.
ENGINEER IN CHARGE. Lt. O. M. Carter.**Legislation.**

Company authorized to construct bridge by act of Aug. 7, 1890, 91, 429.

Plans.

Approved Nov. 4, 1890, 91, 429.

SAWYER CREEK, OSHKOSH, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 621.

Plans.

Reconstruction plans approved Jan. 17, 1899, 99, 621.

SCHUYLKILL RIVER, PHILADELPHIA, PA. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 534.

Plans.

Approved Apr. 17, 1897, 97, 534.

SCHUYLKILL RIVER—PHILADELPHIA, PA. (Sp. and A.)

Commerce.

Large and increasing. Bridge a serious obstruction to navigation, H. Doc. 62, 43d Cong., 1st sess.

Legislation.

Bridge authorized by Congress, H. Doc. 62, 43d Cong., 1st sess.

SCHUYLKILL RIVER AT PHILADELPHIA, PA.; RANCOCAS RIVER, N. J.; RACCOON CREEK, N. J.; SALEM CREEK, N. J.; THE NORTH BRANCH OF THE SUSQUEHANNA, PA.; THE THOROUGHFARE BETWEEN CAPE MAY AND GREAT BAY AT ATLANTIC CITY, N. J.; AND ACROSS FRANKFORD, PENSUKEN, WOODBURY, MANTUA, DARBY, RIDLEY, AND CHESTER CREEKS, N. J.

Engineers.

ENGINEER IN CHARGE. Lt. Col. H. M. Robert. Report, 88, 2612.

Plans.

Description, 88, 2612.

SCOTTS CREEK, NORFOLK COUNTY, VA. (S.)

(Norfolk & Carolina R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 477.
ENGINEER IN CHARGE. Capt. T. L. Casey.

Plans.

Approved, Jan. 9, 1895. Bridge completed. 95, 477.

SCUPPERNONG RIVER, TYRRELL COUNTY, N. C. (O.)

(County bridges.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 625.

Plans.

Required a 40-foot draw in each bridge

to be completed without delay after the money to pay the expenses thereof should be deposited with the county commissioners, 99, 625.

SEEKONK (PAWTUCKET) RIVER, PROVIDENCE, R. I. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 478.
ENGINEER IN CHARGE. Capt. W. H. Bixby.

Plans.

Plans for reconstruction of bridge, in place of "central or red" bridge, approved Feb. 5, 1895, 95, 478.

SEINE RIVER, FRANCE. (See *Thames River, England.*)

SHEBOYGAN RIVER, SHEBOYGAN, WIS. (Sp., etc.)

(Milwaukee, Lake Shore & Western Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 402.

ENGINEER IN CHARGE. Maj. C. E. L. B.

Davis.

Legislation.

Company authorized to construct

bridge under act of Sept. 19, 1890, sec. 7, and by act of the Wisconsin State legislature, 92, 402.

Plans.

Plans for new bridge approved Dec. 23, 1891, 92, 402.

SHREWSBURY RIVER, HIGHLAND BEACH, N. J. (Sp.)

(Navesink R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 401.

ENGINEER IN CHARGE. Capt. T. L.

Casey.

Legislation.

Company authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of New Jersey, 92, 401.

Plans.

Modified plan approved Dec. 2, 1891, 92, 401.

SHREWSBURY RIVER, SOUTH BRANCH (OCEANPORT CREEK), OCEANPORT, N. J. (O.)

(New York & Long Branch R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 428.

Plans.

Alterations to be made in either of two

methods described on or before Sept. 1, 1896; time extended to May 1, 1897, 96, 428.

SKAGIT RIVER, MOUNT VERNON, SKAGIT COUNTY, WASH. (Sp., etc.)

(County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 407.

ENGINEER IN CHARGE. Capt. T. W.

Symons.

Legislation.

County authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Washington, 92, 407.

Plans.

Modified plans approved July 25, 1892, 92, 407.

SKAMOKAWA CREEK, WASH. (S.)

(Wahkiakum County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 429.

ENGINEER IN CHARGE. Maj. J. C. Post.

Plans.

Approved July 30, 1894, 94, 429.

SNAKE RIVER, BETWEEN LEWISTON, IDAHO, AND CONCORD, WASH. (Sp.)

(Lewiston-Concord Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 532.

Legislation.

Company authorized to construct bridge by act of Feb. 15, 1898, 98, 532.

Plans.

Plans submitted Nov. 26, 1897, modified July 6, 1898; approved Aug. 24, 1898, 98, 532.

SNAKE RIVER, NOME CITY, ALASKA. (Sp.)

(Cape Nome Transportation, Bridge & Development Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 698.

Legislation.

Company authorized to construct

bridge by act of May 4, 1900, 1900, 698.

Plans.

Approved May 21, 1900, 1900, 698.

SNAKE RIVER, NEAR TEXAS FERRY, WASHINGTON. (Sp.)

(Oregon Ry. & Navigation Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 370.

ENGINEER IN CHARGE. Maj. W. A. Jones.

Legislation.

Company authorized to construct

bridge by act of July 9, 1888, 89, 370.

Plans.

Approved Feb. 19, 1889. Bridge completed Apr. 30, 1889. 89, 370.

SNOHOMISH RIVER, EVERETT, WASH. (Sp., etc.)

(Land River Improvement Co., of Everett.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 406.

ENGINEER IN CHARGE. Capt. T. W. Symons.

Legislation.

Company authorized to construct

bridge under act of Sept. 19, 1890, sec. 7, and act of Washington, 92, 406.

Plans.

Approved June 2, 1892, 92, 406.

SNOHOMISH RIVER (Sec. 32, T. 29 N., R. 5 E.), AND EBEBY SLOUGH (Sec. 4, T. 28 N., R. 5 E.), WILLAMETTE MERIDIAN, WASH. (Sp., etc.)

(Snohomish, Skykomish & Spokane Ry. and Transportation Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 400.

Legislation.

Company authorized to construct bridges under act of Sept. 19, 1890, sec. 7, and act of Washington, 92, 400.

Plans.

Approved Oct. 30, 1891. Bridge across

Ebeby Slough reported completed in accordance with approved plan, but bridge across Snohomish River had but one clear draw-opening of 99 f., instead of two of 100 f. each, as required. Report dated Apr. 4, 1892. 92, 400.

SNOHOMISH RIVER, SNOHOMISH, WASH. (Sp., etc.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 400.

ENGINEER IN CHARGE. Capt. T. W. Symons.

Legislation.

City authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Washington, 92, 400.

Plans.

Approved July 22, 1891. Completion of bridge reported on Dec. 5, 1891. 92, 400.

SNOHOMISH RIVER, NEAR SNOHOMISH CITY, WASH.
(Sp., etc.)

(St. Paul, Minneapolis & Manitoba Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 407.

ENGINEER IN CHARGE. Capt. T. W. Symons.

Legislation.

Company authorized to construct

bridge under act of Sept. 19, 1890, sec. 7, and act of Washington, 92, 407.

Plans.

Modified plan approved July 28, 1892, 92, 407.

SNOQUALMIE RIVER, NOVELTY, WASH. (S.)

(King County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 699.

Plans.

Approved Sept. 14, 1899, 1900, 699.

SNOQUALMIE RIVER, WASH. (S.)

(Snohomish County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 426.

Plans.

Approved June 9, 1896, 96, 426.

SNOQUALMIE RIVER, NEAR TOLT, WASH. (S.)

(King County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 700.

Plans.

Approved Nov. 22, 1899, 1900, 700.

SOUTH BAY, ELK RIVER, BETWEEN BAY CITY AND LAIDLAW, WASH. (Sp., etc.)

(Chehalis County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 408.

ENGINEER IN CHARGE. Capt. T. W. Symons.

Legislation.

County authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Washington, 92, 408.

Plans.

Modified plan approved Aug. 15, 1892, 92, 408.

SOUTH FORKED DEER RIVER, TENN. (A.)

(Two railroad and five county bridges.)

Engineers.

ENGINEER IN CHARGE. Capt. E. Bergland. Report, 88, 2554.

Plans.

Removal of such of the bridges as are unused recommended, and the insertion of draws in the others, 88, 2554.

SOUTH FORKED DEER RIVER, BELLS DEPOT, TENN. (O.)

(Louisville & Nashville R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 428.

Plans.

Specified alterations required within six months from Nov. 21, 1895. Alterations completed. 96, 428.

SOUTH RIVER, N. J. (O.)

(Raritan River R. R. bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 376.

Plans.

Alterations required by June 1, 1889; time extended to July 11, 1889, then to July 21, 1889. No action taken. 89, 377.

SPUYTEN DUYVIL CREEK, N. Y. (O.)

(New York Central & Hudson River R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 435.

Plans.

Specified alterations required on or before Dec. 1, 1891, 91, 435.

SPUYTEN DUYVIL CREEK, N. Y.

(N. Y. C. & H. R. R. R. Co.)

Engineers

CHIEF OF ENGINEERS. Reports, 94, 430; 98, 534.

ENGINEER IN CHARGE. Lt. R. McGregor.

Plans.

Plans for new bridge approved Aug. 28, 1894, 94, 430. Plans for temporary bridge approved Nov. 22, 1897. 98, 534.

STATEN ISLAND SOUND, ARTHUR KILL. (Sp.)

Commerce.

Dimensions of tows, 87, 2633; 88, 2424.

Height of vessel masts, 87, 2634.

Engineers.

CHIEF OF ENGINEERS. Reports, 87, 337, 2637; 88, 308; 2421.

BOARDS OF ENGINEERS.

Report of Board of 1886, 87, 2632.

Convened at New York City, Apr. 10, 1888, by S. O. Nos. 8 and 9, to examine and report upon Staten Island Bridge. Report, 88, 2423, 2429 (Col. Casey and Lt. Cols. Robert and Hains).

Minority report, 88, 2426 (Maj. King and Capt. Maguire).

Legislation.

Bridge authorized by act of June 16, 1886, 87, 337.

Act authorizing construction of bridge at Arthur Kill, 88, 2425.

Plans.

Description of alterations as proposed by the Board, 88, 2425.

Description of plans proposed, 87, 2635.

STATEN ISLAND SOUND, WESTFIELD, N. Y. (Sp.)

Engineers.

CHIEF OF ENGINEERS. Report, 88, 308.

BOARD OF ENGINEERS. Convened at New York City, Apr. 10, 1888, by S. O. Nos. 8 and 9, to examine and report upon construction of a bridge at Westfield, N. Y., across Staten Island Sound. Report, 88, 2430. (Col. Casey, Lt. Cols. Robert and Hains, Maj. King, and Capt. Maguire.)

Legislation.

Authorized by Senate bill 1850, 88, 2430.

Plans.

The Board reported adversely to a draw and recommended a cantilever bridge of three bays, the center bay to be not less than 900 f. in the clear, with a clear height over the channel way at m. h. w. of 150 f., 88, 2430.

STEAMBOAT RIVER, MINN. (S.)

(St. Paul, Minneapolis & Manitoba Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 534.

Plans.

Approved Mar. 14, 1898, 98, 534.

STILLAGUAMISH RIVER, WASH. (S.)

(Snohomish County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 429.

ENGINEER IN CHARGE. Capt. T. W. Symons.

Plans.

Approved July 13, 1894, 94, 429.

STONE HOUSE COVE, CURTIS BAY, MD. (A.)

(Anne Arundel County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 624, 626.

Plans.

Proceedings instituted, turntable pier

with 30-f. opening on each side, required on or before Dec. 31, 1899; reconstruction plans in accordance approved Aug. 10, 1899, 99, 624, 626.

STURGEON BAY, WIS. (S.)

(Ahnapee & Western Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 428.

ENGINEER IN CHARGE. Maj. J. F. Gregory.

Plans.

Approved Apr. 30, 1894, 94, 428.

STURGEON BAY, WIS. (O.)

(Sturgeon Bay Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 702.

Plans.

Required substantial work to replace

the pier protection and to protect the abutments with suitable lines of fender piling on or before Mar. 15, 1900, 1900, 702.

SULLIVANS ISLAND, CHARLESTON HARBOR, ACROSS COVE, S. C. (S.)

(Mount Pleasant & Seaview City R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 93, 469; 94, 431

ENGINEER IN CHARGE. Capt. F. V. Abbott.

Plans.

Approved Apr. 18, 1893, 93, 469.

Company ordered, Feb. 20, 1894, to remove some piles and a swing bridge from the center pier, to be done within 30 days; afterwards extended to 60 days, 94, 431.

SULPHUR RIVER, ARK. (Sp.)

(Texarkana & Shreveport R. R. Co.)

Engineers.CHIEF OF ENGINEERS. Report, 95, 474.
ENGINEER IN CHARGE. Capt. J. H. Willard.**Legislation.**

Company authorized to construct bridge by act of May 28, 1894, 95, 474.

Plans.

Approved Oct. 16, 1894, 95, 474.

SUNFLOWER AND YAZOO RIVERS. (Sp.)

(Georgia Pacific R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 88, 309, 2488.

Legislation.

Bridge authorized by act of Mar. 3, 1887, 88, 2488.

Plans.

Capt. Willard approved of proposed bridge dimensions with the recommendation that the draw opening be increased from 115 f. in the clear to 125 f., 88, 2488.

SUSQUEHANNA RIVER. (See *Christiana River, Wilmington, Del., etc.*)

SUSQUEHANNA RIVER, NORTH BRANCH OF. (See *Schuylkill River.*)

SWAN CREEK, TOLEDO, OHIO. (S.)

(Lake Shore & Michigan Southern Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 531.

Plans.

Reconstruction plans approved Sept. 15, 1896, 97, 531.

SWINOMISH SLOUGH, WASH. (O.)

(Seattle & Northern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 433.

Plans.

Required alterations to be completed on or before Jan. 1, 1891; time informally

extended to Apr. 1, 1891. Officer in charge reported that the work would probably be completed by Oct. 9, 1891. 91, 433.

SWINOMISH SLOUGH, SKAGIT COUNTY, WASH. (Sp., etc.)

(County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 404.

ENGINEER IN CHARGE. Capt. T. W. Symons.

Legislation.

County authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Washington, 92, 404.

Plans.

Approved Apr. 21, 1892, 92, 404.

TACOMA, ACROSS THE SHIP CHANNEL, WASH. (S.)

(Tacoma City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 426.

ENGINEER IN CHARGE. Capt. T. W. Symons.

Plans.

Approved Sept. 29, 1893. Upon the

city's application of Oct. 30, 1893, the Secretary of War authorized, Nov. 15, 1893, certain modifications of the specified conditions respecting the location of piers. 94, 426.

TALLAHATCHIE RIVER, PHILIPP, MISS. (Sp.)

(Delta Cooperage Co., and the Yazoo & Mississippi Valley R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 530.

Legislation.

Company authorized to construct bridge by act of May 28, 1896, 97, 530.

Plans.

Approved June 1, 1897, 97, 530.

TALLAHATCHIE RIVER, NEAR SWAN LAKE, MISS. (Sp.)
(Tallahatchie County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 698.

Legislation.

County authorized to construct bridge by act of Mar. 1, 1900, 1900, 698.

Plans.

Approved June 25, 1900, 1900, 698.

TANNERS CREEK, NEAR NORFOLK, VA. (S.)
(Norfolk Ry. & Light Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 700.

Plans.

Approved Feb. 15, 1900, 1900, 700.

TANNERS CREEK, NEAR NORFOLK, VA. (S.)
(Norfolk & Atlantic Terminal Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 621.

Plans.

Approved Jan. 18, 1899, 99, 621.

TANNERS CREEK, VA. (A.)
(Tanners Creek Drawbridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 427.

Plans.

Proceedings having been instituted against the company, reconstruction

plans, providing for an increased width of draw opening, and to be in lieu of changes required in notice dated May 16, 1896, were approved June 23, 1896, 96, 427.

TAR RIVER, TARBORO, N. C. (Sp., etc.)
(Albermarle & Raleigh R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 408.

ENGINEER IN CHARGE. Maj. W. S. Stanton.

Legislation.

Company authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of North Carolina, 92, 408.

Plans.

Plans for new bridge approved Aug. 8, 1892, 92, 408.

TAR RIVER, TARBORO, AND BELLS BRIDGE, 13 MILES ABOVE TARBORO, N. C. (O. AND S.)
(Edgecombe County bridges.)

Engineers.

CHIEF OF ENGINEERS. Reports, 95, 483; 96, 426.

Plans.

Each bridge to have a drawspan, with clear openings of 30 f., to be placed over

the middle channel, the openings parallel with current and draws easily worked, to be completed on or before Feb. 1, 1896, 95, 483.

Reconstruction plans for the Tarboro bridge, approved June 5, 1896, 96, 426.

TAUNTON GREAT RIVER, BETWEEN DIGHTON AND BERKLEY, MASS. (S.)
(Bristol County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 427.

Plans.

Reconstruction plans approved Aug. 11, 1896, 96, 427.

TAUNTON RIVER, MASS., SOMERSET TO FALL RIVER. (O.)
(Old Colony R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 89, 374; 90, 340.

ENGINEER IN CHARGE. Maj. W. R. Livermore. Report, 88, 2659.

Legislation.

The matter was referred to the Department of Justice with request that action be taken as prescribed by law, 89, 375.

Notice served as to alterations required, 90, 340.

Plans.

Maj. Livermore recommended placing the draw protection parallel to the current, and increasing the draw opening, 88, 2659.

Alterations required by May 1, 1889. No action taken. 89, 375.

TAYLORS BAYOU, TEX. (S.)

(Jefferson County bridge.)

Engineers.

CHIEF OF ENGINEERS. Reports, 96, 426; 98, 535.

Plans.

Approved June 30, 1896, 96, 426. Re-

construction plans, to replace the one destroyed by storm, approved Mar. 28, 1898, 98, 535.

TECHE BAYOU, BREAUX BRIDGE, ST. MARTINVILLE, LA. (S.)

(St. Martin Parish bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 536.

Plans.

Approved July 8, 1898, 98, 536.

TECHE BAYOU, BULLARDS COVE, LA. (S.)

(St. Martin Parish bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 698.

Plans.

Approved Sept. 11, 1899, 1900, 698.

TECHE BAYOU, CALUMET PLANTATION, LA. (S.)

(Daniel Thompson's bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Approved May 5, 1898, 98, 535.

TECHE BAYOU, JEANERETTE, LA. (S.)

(Town bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 532.

Plans.

Approved Nov. 13, 1896, 97, 532.

TECHE BAYOU, NEAR LOREAUVILLE, LA. (S.)

(Adrien Gonsoulin's bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 429.

ENGINEER IN CHARGE. Maj. J. B. Quinn.

Plans.

Approved July 26, 1894, 94, 429.

TECHE BAYOU, RUTH PLANTATION, ST. MARTIN PARISH, LA. (S.)

(R. Martin Sugar Co., Limited.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 622.

Plans.

Approved Apr. 20, 1899, 99, 622.

**TECHE BAYOU, ST. JOHNS PLANTATION, ST. MARTIN
PARISH, LA. (S.)**

(J. B. Levert's bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 699.

Plans.

Approved Sept. 11, 1899, 1900, 699.

TECHE BAYOU, ST. MARTIN PARISH, LA. (S.)

(J. B. Levert's bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 534.

Plans.

Approved Apr. 29, 1897, 97, 534.

TECHE BAYOU, NEAR ST. MARTINVILLE, LA. (S.)

(Keystone Plantation, John Peters, agent.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 427.

Plans.

Reconstruction plans approved Aug. 18, 1896, 96, 427.

**TECHE BAYOU, ST. MARTINVILLE, ST. MARTIN PARISH,
LA. (S.)**

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 534.

Plans.

Approved July 28, 1897, 97, 534.

TENNESSEE RIVER. (See *Ohio River*.)

TENNESSEE RIVER. (O.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 339.

Virginia & Georgia, and the Memphis & Charleston R. R. companies as to required alterations, 90, 339.

Legislation.

Notice served upon the East Tennessee,

TENNESSEE RIVER, DANVILLE, TENN. (S.)

(Louisville & Nashville R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 536.

Plans.

Reconstruction plans approved June 14, 1898, 98, 536.

**TENNESSEE RIVER, FLORENCE, ALA., DECATUR, ALA.,
BRIDGEPORT, ALA., JOHNSONVILLE, TENN., AND GIL-
BERTSVILLE, KY. (A.)**

(Five bridges.)

Engineers.

ENGINEER IN CHARGE. Lt. Col. J. W. Barlow. Report, 88, 2638.

ment or material modification of the Florence bridge, and that the drawspans of the bridges at Bridgeport, Johnsonville, and Gilbertsville should be enlarged to 150 f. in the clear, 88, 2640.

Plans.

Lt. Col. Barlow reported that the interests of navigation required the abate-

TENNESSEE RIVER, FLORENCE, ALA. (O.)

(East Tennessee, Virginia & Georgia Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 435.

Plans.

Specified alterations required, and completed by Sept. 1, 1891, 91, 435.

TENNESSEE RIVER, FLORENCE, ALA., JOHNSONVILLE, TENN., AND GILBERTSVILLE, KY. (A.)

(Memphis & Charleston; the Nashville, Chattanooga & St. Louis; and the Chesapeake, Ohio & Southwestern railroads.)

Engineers.

ENGINEER IN CHARGE. Maj. W. R. King. Report, 88, 2562.

Plans.

Maj. King recommended the removal

and relocation of the draws in these bridges, 88, 2563.

Tabular statement of bridges on the Tennessee and Cumberland rivers, 88, 2565.

TENNESSEE RIVER, FLORENCE, ALA. (O.)

(Memphis & Charleston R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 374.

Plans.

Alterations required by June 1, 1889; time extended to Dec. 1, 1889, 89, 374.

TENNESSEE RIVER, JOHNSVILLE, TENN. (Sp., etc.)

(Nashville, Chattanooga & St. Louis Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 90, 340; 92, 401; 93, 472.

ENGINEER IN CHARGE. Lt. Col. H. M. Robert.

Legislation.

Company authorized to construct new bridge under acts of Aug. 11, 1888, and Sept. 19, 1890, sec. 4, 90, 340; 92, 401.

Plans.

Proceedings being begun anew under the above acts, plans for new bridge, to replace the old one, were approved Nov. 19, 1891. New bridge to be completed and such portions of old structure as would obstruct navigation removed on or before Nov. 15, 1894; modified plans for altering old bridge approved Apr. 13, 1893. 92, 401; 93, 472.

TENNESSEE RIVER, KNOXVILLE, TENN. (Sp.)

(Marietta & North Georgia R. R. Co., successors to the Knoxville Southern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 463.

ENGINEER IN CHARGE. Lt. Col. H. M. Robert.

Legislation.

Company authorized to construct bridge by act of Aug. 9, 1890; amended as to time within which the bridge was to be commenced and completed by act of July 26, 1892, 93, 463.

Operations.

On Feb. 8, 1893, bridge reported completed, 93, 463.

Plans.

Knoxville Southern R. R.'s plan approved Feb. 27, 1890. Modified plans of the Marietta & North Georgia R. R. Co. approved Sept. 29, 1892, but merger of companies not recognized. 93, 463.

TENNESSEE RIVER, KNOXVILLE, TENN. (Sp.)

(Knox County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 424.

Legislation.

County authorized to replace existing structure by act of Mar. 28, 1896, 96, 424.

Plans.

Plans to replace the existing structure approved June 13, 1896, 96, 424.

TENNESSEE RIVER, CHATTANOOGA. (Sp.)

(Memphis and Charleston R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 88, 309, 2513.

Legislation.

Bridge authorized by act of Feb. 28, 1887, 88, 2510.

Plans.

Modified plans submitted, giving 270 f. in the clear, would afford no obstacle to existing navigation, 88, 2512.

TENNESSEE RIVER (LITTLE), NEAR NILES FERRY, TENN. (O.)

(Marietta & North Georgia Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 435.

Plans.

Specified alterations required on or before Jan. 1, 1892, 91, 435.

TENNESSEE RIVER, PERRYVILLE, TENN. (Sp.)

(Tennessee Midland R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 336.

Plans.

Revised plan and location submitted, and approved by the Secretary of War Aug. 21, 1889, 90, 336.

Legislation.

Authorized by act of May 14, 1888, 90, 336.

TENSAS RIVER, DANIELS FERRY, LA. (Sp.)

(The New Orleans, Natchez & Fort Scott R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 337.

Plans.

Plan and location submitted, and approved by Secretary of War Dec. 19, 1889, 90, 337.

Legislation.

Authorized by act of Mar. 1, 1889, 90, 337.

TENSAS RIVER, NEAR MOBILE, ALA. (S.)

(Louisville & Nashville R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 699.

Plans.

Reconstruction plans approved Sept. 28, 1899. 1900, 699.

THAMES RIVER, ENGLAND, AND SEINE RIVER, FRANCE.**Engineers.**

ENGINEER IN CHARGE. Lt. Col. J. Newton, 1875. Report, 75, ii, 228.

Projects.

Description of bridges crossing both rivers, 75, ii, 228.

THAMES RIVER, ENTRANCE TO LONG AND CLARKS COVE, CONN. (S.)

(Norwich & Worcester R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 536.

Plans.

Plans for openings to be left at these localities (between Allyns Point and Groton), approved July 11, 1898, 98, 536.

THAMES RIVER, NEAR NEW LONDON, CONN. (Sp.)**Engineers.**

CHIEF OF ENGINEERS. Report, 84, 269.

Plans.

BOARD OF ENGINEERS. Report, 84, 1770. (Col. Newton, Lt. Col. Elliot, and Maj. McFarland, U. S. Army, and Capt. Pythian and Comdr. Mahan, U. S. Navy.)

The following modifications were recommended by Board of Engineers and approved by Secretary of War: The bridge to be raised to leave a clear height of 30 feet at high water; the draw to be provided with suitable pier rests; a steam fog-signal and suitable lights to be attached to the bridge, 84, 1770.

Legislation.

Bridge authorized by act of March 3, 1883, 84, 269.

THREE-MILE CREEK, ALA. (A.)

(Mobile County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **93**, 473.

ENGINEER IN CHARGE. Maj. A. N. Damrell.

Plans.

Plans, for change to drawbridge, approved Apr. 24, 1893, **93**, 473.

THREE-MILE CREEK, NEAR MOBILE, ALA. (A.)

(Mobile & Birmingham Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **94**, 430.

ENGINEER IN CHARGE. Maj. A. N. Damrell.

Plans.

Proceedings having been instituted

against the R. R. Company, alteration plans were approved Nov. 29, 1893, on condition that the existing obstruction be removed by Feb. 11, 1894; time extended to May 11, and to July 31, 1894, **94**, 430.

THREE-MILE CREEK, NEAR MOBILE, ALA. (S.)

(Mobile County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **1900**, 700.

Plans.

Approved Jan. 18, 1900, **1900**, 700.

TOMBIGBEE RIVER, WAVERLY, GA. (Sp.)

(Georgia Pacific R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, **88**, 309, 2508.

Legislation.

Bridge authorized by act of Mar. 3, 1887, **88**, 2508.

Plans.

Bridge as proposed not considered an obstruction to navigation, **88**, 2508.

TOMBIGBEE RIVER, MISS. (Sp.)

(Monroe County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **99**, 618.

Legislation.

County authorized to construct bridge by act of July 7, 1898, **99**, 618.

Plans.

Modified plans approved Nov. 3, 1898, **99**, 618.

TOWNSEND GUT, TOWNSEND, ME. (S.)

(Town bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, **96**, 426.

Plans.

Approved May 1, 1896, **96**, 426.

TOWN CREEK, N. C. (A.)

(County bridge.)

Plans.

Capt. Bixby recommended that the insertion of a drawspan of 40 f. clear be required, **88**, 2546.

TOWN CREEK, BRUNSWICK COUNTY, N. C. (A.)**Engineers.**

ENGINEER IN CHARGE. Capt. F. A. Hinman. Report, 88, 2543.

Plans.

Draw opening or the removal of the bridge recommended, 88, 2543.

TRADEWATER RIVER, KY. (Sp.)

(Ohio Valley R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 88, 309.

Legislation.

Bridge authorized by act of Feb. 21, 1887, 88, 2472.

Plans.

Description of proposed bridge, 88, 2473.

Maj. Stickney reported that the bridge, when finished as proposed, would present no material obstacle to navigation, 88, 2473.

TRAIL CREEK, FRANKLIN STREET, MICHIGAN CITY, IND.

(A. and Sp.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 338.

ENGINEER IN CHARGE. Maj. W. Ludlow, 1889-90. Report, 89, 2803.

Legislation.

Construction authorized by acts of June 29, 1888, 89, 2803; and April 22, 1890, 90, 338.

Plans.

If properly constructed, and particularly if maneuvered by steam, this bridge would not obstruct navigation to any great extent, 89, 2803.

Plan and location submitted, and approved by Secretary of War June 4, 1890, 90, 338.

TRAIL CREEK, SIXTH STREET, MICHIGAN CITY, IND. (A.)

(City bridge.)

Engineers.

ENGINEER IN CHARGE. Maj. W. Ludlow, 1889. Report, 89, 2803.

Plans.

Partly obstructs navigation, 89, 2803.

TRENT RIVER, NEWBERN, N. C. (O.)

(Atlantic & North Carolina R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 431.

Plans.

Specified alterations required on or before Sept. 1, 1894; time extended to Apr. 1, 1895, 94, 431.

TRENT RIVER, NEWBERN, N. C. (S.)

(Craven County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 533.

Plans.

Approved Oct. 26, 1897, 98, 533.

TRENT RIVER, NEAR POLLOKSVILLE, N. C. (S.)

(Atlantic Coast Line bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 536.

Plans.

Reconstruction plans of pivot pier of draw approved Aug. 2, 1898, 98, 536.

TRINITY RIVER, ABOVE MARIANNA, TEXAS. (S.)

(Houston, East & West Texas Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 534.

Plans.

Reconstruction plans approved May 8, 1897, 97, 534.

TROUT CREEK, FLA. (O.)

(Florida Central & Peninsular R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 435.

Plans.

To so arrange the drawspan and re-

move piles as to give a clear passage through the drawspan, alterations to be and were completed by July 20, 1891, 91, 435.

TULLS CREEK, TULLS, N. C. (O.)

(Currituck County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 411.

Plans.

Specified alterations required to be and were completed by June 1, 1892, 92, 411.

UNITED STATES, FOX RIVER, JOHN STREET, APPLETON, WIS. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 532.

Plans.

Reconstruction plans approved Oct. 10, 1896, 97, 532.

VERMILION RIVER, ABBEVILLE, LA. (S.)

(Vermilion Parish bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 425.

Plans.

Reconstruction plans approved Sept. 23, 1896, 96, 425.

WABASH RIVER, NEAR MEROM, IND. (Sp.)

Engineers.

CHIEF OF ENGINEERS. Report, 82, 263; 2011.

Plans.

Approval of, recommended by Chief of Engineers, 82, 2011.

Legislation.

Bridge authorized by act of June 30, 1879, 82, 263.

WABASH RIVER. (A.)

(1, Main street bridge at Lafayette; 2, Lake Erie & Western R. R. bridge at Lafayette; 3, Wabash, St. Louis & Pacific R. R. bridge at Attica; 4, Chicago & Great Southern R. R. bridge at Attica; 5, Indiana, Bloomington & Western R. R. bridge at Covington, and Columbus & St. Louis R. R. bridge near Lodi, Ind.)

Engineers.

ENGINEER IN CHARGE. Maj. A. M. Miller. Report, 88, 2556.

gation at and above a medium stage of water, and recommended the insertion of drawspans over the h. w. channel, of 60-f. width in the clear, 88, 2557.

Plans.

Maj. Miller reported all these bridges complete obstructions to steamboat navi-

WABASH AND WHITE RIVERS, IND. (A.)

Engineers.

CHIEF OF ENGINEERS. Report, 90, 341.

ENGINEER IN CHARGE. Maj. A. Stickney. Report, 88, 2647.

ASSISTANT. O. L. Petitdidier. Report, 88, 2647.

ing total obstructions at high stages, 88, 2648. Maj. Stickney recommended that it be made optional with the bridge owners whether they insert a draw and guard pier or raise their bridges enough to obtain 20-f. clearance between the lower cord and h. w. mark, 88, 2648.

Plans.

List of bridges without draws and form-

WALLUSKI RIVER, OREG. (Sp., etc.)

(Clatsop County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 400.

ENGINEER IN CHARGE. Maj. T. H. Handbury.

Legislation.

County authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Oregon, 92, 400.

Plans.

Modified plans approved Oct. 26, 1891, 92, 400.

WARRIOR RIVER, FOSTERS FERRY, ALA. (S.)

(Tuscaloosa County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Approved July, 19, 1899, 99, 623.

WAPPOO CUT, ST. ANDREWS PARISH TO JAMES ISLAND, S. C. (S.)

(Wappoo Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 620.

Plans.

Approved Sept. 22, 1898, after change made in location, 99, 620.

WARRIOR RIVER, TUSCALOOSA COUNTY, ALA. (Sp., etc.)

(Mobile & Ohio R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 97, 531.

Plans.

Approved Aug. 19, 1897, 97, 531

Legislation.

Company authorized to construct bridge by act of June 11, 1896, 97, 531.

WARRIOR RIVER, TUSCALOOSA TO NORTHPORT, ALA. (O.)

(Tuscaloosa County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 483.

between pier No. 1 and pier No. 2 to give a clear opening of 90 f.; to be completed on or before Dec. 1, 1895, 95, 483.

Plans.

Requiring a draw to be placed in bridge

WASHINGTON, D. C.—CABIN JOHN BRIDGE (STONE BRIDGE).

(Bridge No. 4.)

Contracts.

1872. Lee Palmer & Co., coping (contract annulled). J. Muddaman, coping (contract annulled). R. A. Shinn & Co., 6,950 c. f. coping. 72, 1022, 1023.

ASSISTANT. T. B. Samo. Report, 71, 955.

Engineers.

ENGINEERS IN CHARGE:

Maj. G. H. Elliot, 1871. Report, 71, 949.

Maj. O. E. Babcock, 1872-76. Reports, 72, 1022; 73, 1166; (Col.) 76, ii, 693.

Col. G. H. Elliot, 1892-94. Reports, 92, 3360; 93, 4290, 4298; 94, 3203.

Maj. J. G. D. Knight, 1895. Report, 95, 4105.

Capt. D. D. Gaillard, 1896. Report, 96, 3914.

Operations.

1873. Cutting and setting stone for repairs to bridge, 73, 1167.

1875-76. Pavements repaired, 76, ii, 693.

1892-93. Roadway repaired, 93, 4290.

1894-95. Bridge repaired with vitrified brick, 95, 4105.

1895-96. Parapet walls repaired, 96, 3914.

Projects.

Maj. Elliot submitted, 1871, plans for repairs, 71, 949.

WASHINGTON, D. C.—COLLEGE POND. (Iron.)

(Bridge No. 5.)

Engineers.

ENGINEERS IN CHARGE:

Maj. N. Michler, 1867-69.
Col. O. E. Babcock, 1873-76. Reports, 73, 1166; 74, ii, 400; 75, ii, 815; 76, ii, 694.
Lt. Col. T. L. Casey, 1880. Report, 80, 2345.
Lt. Col. A. M. Miller, 1900. Report, 1900, 5196.

ASSISTANT. T. B. Samo. Reports, 67, 550; 69, 506

Operations.

1867. Bridge is in a good condition, 67, 550.

1868-1900. Bridge painted, 69, 506; 80, 2345, 1900, 5196.

WASHINGTON, D. C.—GRIFFITH PARK BRIDGE.

(Bridge No. 3.)

Contracts.

1872. R. A. Shinn & Co., 3,106 c. f. coping, 72, 1023.

Engineers.

ENGINEERS IN CHARGE:

Maj. G. H. Elliot, 1871. Report, 71, 949.
Maj. O. E. Babcock, 1872-76. Reports, 72, 1023; (Col.) 76, ii, 690.
Col. G. H. Elliot, 1892-94. Reports, 92, 3361; 93, 4290, 4298; 94, 3203.
Maj. J. G. D. Knight, 1894. Report, 94, 4105.

Capt. D. D. Gaillard, 1896. Report, 96, 3914.

ASSISTANT. T. B. Samo, Report, 71, 955.

Operations.

1876. Pavements repaired, 76, ii, 693.

1893-94. Bridge repaired with vitrified bricks, 94, 4105.

1895-96. Parapet walls repaired, 96, 3914.

WASHINGTON, D. C.—RECEIVING RESERVOIR (DELECARLIA).

(Wooden bridge over waste channel.)

Engineers.

ENGINEERS IN CHARGE:

Lt. Col. T. L. Casey, 1880-81. Reports, 80, 2348; 81, 2703.
Col. G. H. Elliot, 1892-94. Reports, 92, 3360; 93, 4290, 4299; 94, 3203.
Maj. J. G. D. Knight, 1895. Report, 95, 4105.
Capt. D. D. Gaillard, 1896. Report, 96, 3914.
Capt. T. A. Bingham, 1898. Report, 98, 3630.
Lt. Col. A. M. Miller, 1899-1900. Reports, 99, 3785; 1900, 5196.

1892-95. Bridge repaired, 93, 4290; 95, 4105.

1895-96. Extensive repairs made, 96, 3914.

1897-98. Floor repaired, 98, 3630.

1898-99. Minor repairs made, 99, 3785.

1899-1900. Floor renewed, 1900, 5196.

Projects.

Description of bridge. In a dangerous condition. 80, 2348.

Erected in 1863, rebuilt in 1881, 81, 2704.

Col. Elliot estimated, 1893, it would cost \$18,000 to replace this bridge with a masonry bridge, 93, 4299.

Operations.

1880-81. Bridge rebuilt, 81, 2704.

WASHINGTON AQUEDUCT, STONE BRIDGES ON.

Contracts.

1873. T. Harvey, cut-stone parapets and coping for bridges Nos. 1, 2, and 3, 73, 1167.

Engineers.

ENGINEERS IN CHARGE:

Maj. N. Michler, 1867-70.
Maj. G. H. Elliot, 1871.
Maj. O. E. Babcock, 1872-73. Reports, 72, 1022; 73, 1167.

ASSISTANT. T. B. Samo. Reports, 67, 549; 68, 908; 69, 505; 70, 524; 71, 955.

Operations.

1866-67. Bridges Nos. 1, 2, 3, and

5 are unfinished, 67, 549; 68, 908; 69, 405; 70, 524.

1872-73. Bridges Nos. 1, 2, and 3 completed, 74, ii, 399.

Projects.

Importance of these bridges can not be overestimated. In their present state they are rapidly deteriorating, and if winters continue as cold and as changeable as the last, their usefulness for aqueduct purposes will soon become seriously impaired. 67, 549.

WATEREE RIVER, S. C. (A.)

(South Carolina R. R. and Wilmington, Columbia & Augusta R. R.)

Engineers.

ENGINEER IN CHARGE. Capt. W. H. Bixby. Report, 88, 2548.

Legislation.

Use of South Carolina R. R. bridge without draw authorized by State acts of 1853 and 1858, 88, 2548.

Plans.

Capt. Bixby reported both bridges an obstruction to navigation, and recommended that the insertion of suitable drawspans 60 f. in the clear be required, 88, 2548.

WEST BAY, GALVESTON ISLAND TO VIRGINIA POINT, TEX.

(Sp., etc.)

(Galveston County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 407.

ENGINEER IN CHARGE. Maj. C. J. Allen.

Legislation.

County authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Texas, 92, 407.

Plans.

Approved July 20, 1892, 92, 407.

WESTPORT RIVER, EAST BRANCH, WESTPORT POINT, MASS. (S.)

(Bristol County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 94, 429.

ENGINEER IN CHARGE. Capt. W. H. Bixby.

Plans.

Approved July 5, 1894, 94, 429.

WEST RIVER, KIMBERLY AVENUE, CONN. (O.)

(New Haven & Orange bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 1900, 702.

Plans.

Specified alterations required on or before Oct. 14, 1900, 1900, 702.

WHITE OAK BAY, HOUSTON, TEX. (S.)

(Missouri, Kansas & Texas R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 466.

ENGINEER IN CHARGE. Maj. C. J. Allen.

Plans.

Approved Nov. 28, 1892, 93, 466.

WHITE RIVER, IND. (See Wabash River.)**WHITE RIVER, NEAR DECKERS STATION, AND ABOVE THE MOUTH OF THE WEST FORK, IND. (A.)**

(Evansville & Terre Haute R. R. Co. and the Evansville & Indianapolis R. R. Co.)

Engineers.

ENGINEER IN CHARGE. Maj. A. M. Miller. Report, 88, 2558.

Draw should be placed in the Evansville and Indianapolis bridge, and the location of the draw in Evansville and Terre Haute bridge changed, 88, 2558.

Plans.

Description of the bridges, 88, 2558.

WHITE RIVER, IND. (O.)

(Evansville & Terre Haute R. R. Co. and Indianapolis R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 89, 376.

Plans.

Alterations for the 2 bridges required by Jan. 1, 1890, 89, 376.

WHITE RIVER, NEAR ORILLA, WASH. (S.)
(King County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 99, 623.

Plans.

Approved June 10, 1899, 99, 623.

WILLAMETTE RIVER, ALBANY, OREG. (Sp.)
(Oregon Central & Eastern R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 96, 422.

Legislation.

Company authorized to construct bridge by act of June 24, 1884, 96, 422.

Plans.

Alteration plans, reducing the length of the fixed spans, approved Sept. 30, 1895, 96, 422.

WILLAMETTE RIVER PORTLAND, OREG. (Sp.)

Commerce.

Requirements of, on Willamette River, 82, 2046, 2047, 2051, 2056, 2083, 2091.

Engineers.

CHIEF OF ENGINEERS. Reports, 73, 63, 592; 82, 263; 85, 292; 87, 339.

BOARD OF ENGINEERS.

Convened at Portland, Oreg., in November, 1872, and reported in favor of the plan, with certain requirements of location. Report, 73, 593. Approved by Chief of Engineers and Secretary of War, Jan. 2, 1873, 73, 593. (Lt. Col. Alexander, Majs. Stewart, Mendell, and Robert, and Lt. Weedon.)

Report, 87, 2663-2669.

Legislation.

Bridge authorized by act of Feb. 2, 1870, 73, 592.

State legislation, 1878, authorizing construction of bridge, 82, 2043, 2044, 87, 2669.

Plans.

Described, 73, 594. Submitted by city of Portland, Oreg., referred to Board of Engineers, 73, 592.

General description of bridge proposed, 82, 2052, 2080.

Opposition to construction of bridges at location proposed, 82, 2044, 2046, 2058, 2068.

Construction of bridge commenced in 1880, 82, 2050. Width of spans considered inadequate and location of bridge improper, 82, 2064.

Action of Department of Justice toward protecting the rights of the United States, 82, 2067, 2072.

Injunction granted against construction of bridge by United States circuit court, 1881, 82, 2082, 2094.

Petition in 1885 for construction of bridge, 85, 1918.

WILLAMETTE RIVER, BURNSIDE AND KNIGHT-QUINBY STREETS, PORTLAND, OREG. (Sp., etc.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 409.

BOARD OF ENGINEERS. (Maj. T. H. Handbury, Capt. T. W. Symons, and Lt. H. Taylor.)

ENGINEER IN CHARGE. Maj. T. H. Handbury.

Legislation.

City authorized to construct bridges

under act of Sept. 19, 1890, sec. 7, and act of Oregon, 92, 409.

Plans.

Plans for 2 drawbridges; reported adversely upon by Board of Engineers' recommendation for disapproval; concurred in by the Chief of Engineers; approved Aug. 24, 1892, 92, 409.

WILLAMETTE (LOWER) RIVER, PORTLAND, OREG. (A.)
(North Pacific R. R. bridge, and wagon bridge.)

Engineers.

ENGINEER IN CHARGE. Capt. C. F. Powell. Report, 88, 2593.

Plans.

Both structures a menace to navigation; should be wholly removed, 88, 2593.

WILLAMETTE (UPPER) RIVER, OREG. (Ferry cables across.) (A.)**Engineers.**

ENGINEER IN CHARGE. Maj. W. A. Jones. Report, 88, 2590.

Plans.

List of localities at which such obstructions exist, 88, 2590.

WILLAMETTE RIVER, SALEM, OREG. (Sp.)**Engineers.**

CHIEF OF ENGINEERS. Report, 87, 339.
BOARD OF ENGINEERS. Of 1887. Report, 87, 2683.

Legislation.

Bridge authorized by act of July 29, 1886.

Plans.

Bridge already built when plans were submitted for approval. With slight modifications the bridge not a serious obstruction to navigation, 87, 339, 2687.

WILLAMETTE RIVER, ALBANY, WASH. (Sp., etc.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 402.
ENGINEER IN CHARGE. Maj. T. H. Handbury.

Legislation.

Company authorized to construct bridge by act of Dec. 26, 1890, 92, 402.

Plans.

Modified plans approved Dec. 23, 1891, 92, 402.

WILLAPA RIVER, SOUTH ARM, WASH. (Sp., etc.)

(United Railroads of Washington.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 407.
ENGINEER IN CHARGE. Capt. T. W. Symons.

Legislation.

Company authorized to construct bridge under act of Sept. 19, 1890, sec. 7, and act of Washington, 92, 407.

Plans.

Approved July. 7, 1892, 92, 407.

WILMINGTON LAGOON SLOUGH, INNER HARBOR OF SAN PEDRO, CAL. (S.)

(Kerckhoff-Cuzner Mill & Lumber Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Approved Mar. 29, 1898, 98, 535.

WISCONSIN RIVER, NEAR LONE ROCK, WIS. (S.)

(Lone Rock Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 478.
ENGINEER IN CHARGE. Capt. C. F. Palfrey.

Plans.

Approved Feb. 21, 1895, 95, 478.

WISHKA RIVER, WASH. (S.)

(United Railroads of Washington.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 533.

Plans.

Approved Oct. 2, 1897, 98, 533.

WITHLACOOCHEE RIVER, DUNELLON, FLA. (S. and A.)
(Silver Spring, Ocala & Gulf Ry. Co.)

Engineer

CHIEF OF ENGINEERS. Reports, 94, 429, 95, 478.

ENGINEERS IN CHARGE:

Capt. W. M. Black, 1889. Report, 89, 2797.

Maj. T. H. Handbury, 1894-95.

Plans.

No proper drawspan; very little navigation, 89, 2797.

Plans for new bridge approved June 14, 1894, 94, 429. Modified plans submitted Feb. 6, 1895, approved Feb. 23, 1895. 95, 478.

WITHLACOOCHEE AND PEACE RIVERS. (A.)

(Florida Southern, the South Florida, and the Florida R. R. & Navigation Co.)

Engineers.

ENGINEER IN CHARGE. Lt. W. M. Black. Report, 88, 2630.

Plans.

Bridges would have to be provided with draws if an improvement be undertaken, 88, 2631.

WOODBURY CREEK. (See Schuylkill River.)

WORTH LAKE, PALM BEACH, FLA. (S.)

(Jacksonville, St. Augustine, & Indian River R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 479.

ENGINEER IN CHARGE. Lt. A. M. D'Armit.

Plans.

Approved July 19, 1895, 95, 479.

WOLF RIVER, GILLS LANDING, WIS. (S.)

(Wisconsin Central R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 94, 427, 95, 477.

ENGINEERS IN CHARGE:

Maj. J. F. Gregory, 1894.

Capt. C. F. Palfrey, 1895.

Plans.

Plans for new bridge approved Dec. 7, 1893, 94, 427. Modified plans approved Feb. 5, 1895, 95, 477.

WOLF RIVER, NEW LONDON, WIS. (Sp., etc.)

(Milwaukee, Lake Shore & Western Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 404.

ENGINEER IN CHARGE. Maj. J. F. Gregory.

Legislation.

Company authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Wisconsin, 92, 404.

Plans.

Plans for new bridge approved Mar. 22, 1892, 92, 404.

WOLF RIVER, NORTHPORT, MUKWA, WIS. (S.)

(Mukwa Town bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 534.

Plans.

Approved Jan. 12, 1898, 98, 534.

YALOBUSHA RIVER, LEFLORE COUNTY, MISS. (Sp.)

(Yazoo & Mississippi Valley R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 532.

Legislation.

Company authorized to construct bridge by act of July 7, 1898, 98, 532.

Plans.

Approved July 16, 1898, 98, 532.

YAMHILL RIVER, NEAR LAFAYETTE, YAMHILL COUNTY, OREG. (Sp., etc.)

(Oregonian R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 402.
ENGINEER IN CHARGE. Maj. T. H. Handbury.

Legislation.

Company authorized to construct bridge

under act of Sept. 19, 1890, sec. 7, and act of Oregon, 92, 402.

Plans.

Reconstruction plan approved Dec. 12, 1891, 92, 402.

YAZOO RIVER. (See Sunflower River.)**YAZOO RIVER, GREENWOOD, MISS. (Sp.)**

(Leflore County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 531.

Legislation.

County authorized to construct bridge

by act of Mar. 3, 1897, amending act Apr. 29, 1898, 98, 531.

Plans.

Approved May 12, 1898, 98, 531.

YELLOW MILL POND, STRATFORD AVENUE, BRIDGEPORT, CONN. (S.)

(City bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 533.

Plans.

Reconstruction plan approved Oct. 12, 1897, 98, 533.

YELLOWSTONE RIVER, GLENDIVE, MONT. (Sp.)

(Dawson County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 475.
ENGINEER IN CHARGE. Capt. H. F. Hodges.

Legislation.

County authorized to construct bridge by act of Feb. 26, 1895, 95, 475.

Plans.

Approved July 9, 1895, 95, 475.

YOUGHIOGHENY RIVER, BOSTON, PA. (S. Sp.)

(Boston Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 92, 408.
ENGINEER IN CHARGE. Maj. A. Stickney.

under act of July 13, 1892, sec. 3, and act of Pennsylvania, 92, 408.

Plans.

Approved Aug. 15, 1892, 92, 408.

Legislation.

Company authorized to construct bridge

YOUGHIOGHENY RIVER, FAYETTE COUNTY, PA. (S.)

(Youghiogheny Central Ry. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 93, 466.
ENGINEER IN CHARGE. Lt. Col. A. Stickney.

Plans.

Approved Sept. 24, 1892, 93, 466.

YOUGHIOGHENY RIVER, FIFTH AVENUE, McKEESPORT, PA. (S.)

(Fifth Avenue & High Street Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 95, 479.

ENGINEER IN CHARGE. Maj. R. L. Hoxie.

Plans.

Approved July 31, 1896, 95, 479.

YOUGHIOGHENY RIVER, BETWEEN McKEESPORT AND REYNOLDTON, PA. (S.)

(Pittsburg & Lake Erie R. R. Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 535.

Plans.

Reconstruction plans approved Apr. 29, 1898, 98, 535.

YOUGHIOGHENY RIVER, McKEESPORT, PA. (S. and Sp.)

(Port View Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Report, 91, 431.

ENGINEER IN CHARGE. Lt. Col. W. E. Merrill.

Legislation.

Company authorized to construct

bridge under act of Sept. 19, 1890, sec. 7, and act of Pennsylvania, 91, 431.

Plans.

Approved Feb. 28, 1891, 91, 431.

YOUGHIOGHENY RIVER, SUTERVILLE, PA. (S.)

(Allegheny & Westmoreland Bridge Co.)

Engineers.

CHIEF OF ENGINEERS. Reports, 96, 425; 97, 533.

Plans.

Approved Dec. 30, 1895, for a suspen-

sion bridge, 96, 425. A truss bridge was built, for which plans were approved Apr. 13, 1897, 97, 533.

YOUNGS BAY, ASTORIA, OREG. (S.)

(Clatsop County bridge.)

Engineers.

CHIEF OF ENGINEERS. Report, 98, 537.

Plans.

Modified plans approved Aug. 16, 1898, 98, 537.

YOUNGS BAY, OREG. (S.)

(Astoria & Columbia River R. R. Co., successors to the Sea Shore Road Co.)

Engineers.

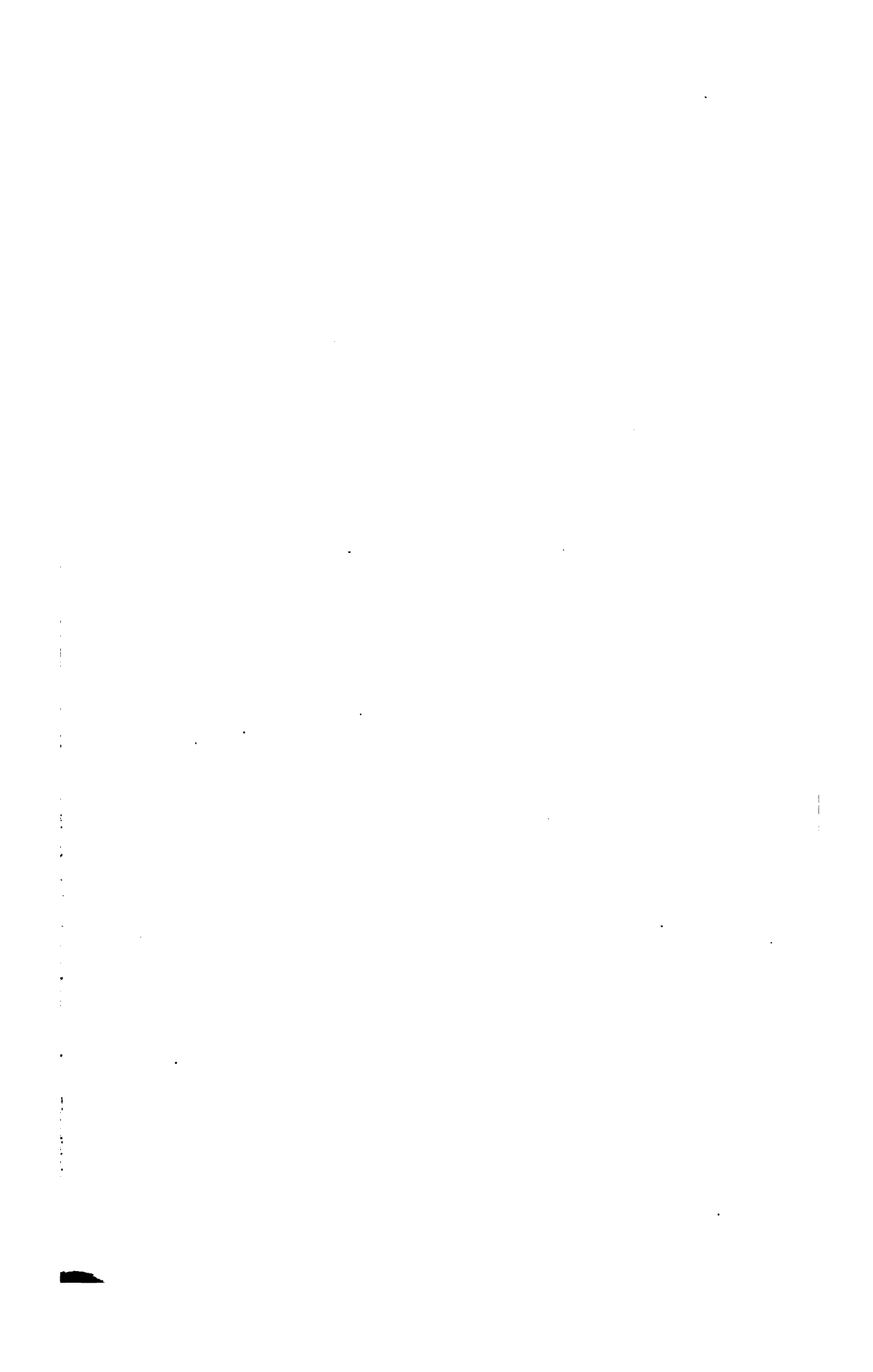
CHIEF OF ENGINEERS. Reports, 94, 428; 96, 425.

ENGINEER IN CHARGE. Maj. J. C. Post.

Plans.

Approved Mar. 14, 1894, 94, 428. The

Sea Shore Road Co., having relinquished its right to construct this bridge, plans submitted by the Astoria & Columbia River R. R. Co. were approved Nov. 18, 1895, 96, 425.



ABSTRACT OF LAWS

RELATING TO

RIVER AND HARBOR IMPROVEMENTS AND OTHER PUBLIC WORKS OF THE UNITED STATES,

FROM 1790 TO 1900.

This abstract has been compiled from the following authorities, viz: "Laws of the United States relating to the improvement of rivers and harbors, from August 11, 1790, to March 3, 1887, compiled in the Office of the Chief of Engineers, United States Army, under the direction of John G. Parke, Colonel of Engineers, Brevet Major-General United States Army," and also from the "Laws affecting the Corps of Engineers, United States Army," as published in the annual reports of the Chief of Engineers, U. S. Army, since 1875.

For the interval between 1790 and 1875 the first-named publication was the authority from which the abstract was made; between 1886 and 1887 both publications have been used, while from 1887 to 1900, inclusive, the annual reports of the Chief of Engineers only have been used.

The abstract has been alphabetically arranged under the most suggestive headings, with cross references under secondary or minor headings. It is intended to cover the salient points only of the laws referred to, with the expectation that the acts of Congress themselves will be consulted for detailed and exact information.

The dates appended to each paragraph of the abstract are the dates of the laws from which the abstract is made.

This abstract is intended to cover only such legislation as has been general and permanent in its character, and not special or local legislation, or that which applied to temporary provisions in the river and harbor appropriation bills.

Advertisements. (See *Supplies*.)

Alterations. (See *River and harbor alterations*.)

Anchorage. (See *Obstructions*.)

Appropriations. (See *Public works; Repairs*.)

For river or harbor improvements, to remain subject to the disposal of the Secretary of War until the works for which the appropriations were made are completed, or until otherwise ordered by Congress. (July 23, 1866, sec. 3; Mar. 2, 1867, sec. 2; June 20, 1874, sec. 5.)

Boats. (See *Obstructions*.)

Bonds. (See *Public works*.)

Required from all persons making disbursements, except officers in the Regular Army. (June 23, 1866, sec. 3; Mar. 2, 1867, sec. 3.)

Breakwaters. (See also *Public property*.)

Use, occupation, or injury of, by persons or corporations prohibited.

Bridges. (See *Drawbridges*.)

Any bridge over any navigable water of the U. S. which is an obstruction to free navigation by reason of difficulty in passing the draw or raft span shall be

provided with aids to the passage of such spans. (July 5, 1884, sec. 8; see also Mar. 3, 1875.)

Owners of bridge piers or abutments so built over navigable waters of the U. S. as to produce caving banks or other damage to property shall be liable to persons injured. (Aug. 11, 1888, sec. 2.)

Bridges obstructing navigation over navigable waterways of the U. S. shall be altered upon notice by the Secretary of War, so as to render navigation through or under bridges safe, easy, and unobstructed. (Aug. 11, 1888, secs. 9, 10; amended Sept. 19, 1890, sec. 4.)

No bridge, pier, or abutments to be built over or in any navigable waters prior to the approval of the location and plans of such bridge by the Secretary of War. (Sept. 19, 1890, sec. 7; amended July 13, 1892, sec. 3.)

The consent of Congress must be obtained for the building of bridges, dams, dikes, or causeways over navigable waters, and plans must be submitted to and approved by Chief of Engineers and Secretary of War. Legislatures, however, may give the necessary authority for such structures on waters wholly within the State, with approval as above. There shall be no deviation from the approved plans. (Mar. 3, 1899, sec. 9.)

The Secretary of War may require that any bridge across the navigable waters of the U. S. which he believes to be an unreasonable obstruction on account of height, width of span, or otherwise, or where there is difficulty in passing, shall be altered within a reasonable time, to conform to the changes recommended by the Chief of Engineers, under penalty, which penalty shall be repeated for every month the violation is continued. An appeal, however, may be taken, by either the violators or the U. S., from the various courts to the Supreme Court. (Mar. 3, 1899, sec. 18.)

Bulkheads. (See *Harbor lines*.)

Canals—Regulations governing use of canals and similar works of navigation.

The Secretary of War may prescribe rules and regulations for the use of canals and such works owned, operated, or maintained by the U. S. They shall be posted conspicuously in public. Penalty for violation shall be fine or imprisonment, at the discretion of the U. S. court. (Aug. 17, 1894, sec. 4.)

Causeways. (See *Bridges, etc.*)

Channels.

Unlawful to fish or dredge for shell-fish in ship channels of New York Harbor or to interfere in any way with the safe navigation of such channels by ocean steamships and ships of deep draft. Penalty shall be fine or imprisonment or both. Arrests to be made by supervisor of the harbor or his deputies, and the culprits are to be brought before a commissioner, judge, or court of the U. S. (Aug. 17, 1894, sec. 2.)

Chief of Engineers.

Act providing for filling vacancies in the office of the Chief of Engineers. (June 10, 1870; amended June 30, 1879.)

City refuse. (See *Dumping*.)

Civilian engineers.

Not exceeding five, may be employed by the Chief of Engineers on surveys and works of improvement of western and northwestern rivers, at compensation not to exceed \$3,000 per annum. (Mar. 29, 1867.)

Secretary of War shall report at each session of Congress the name and residence of each civilian engineer employed on the work of improving rivers and harbors; also time employed, compensation paid, and peculiar work on which engaged. (Aug. 5, 1886, sec. 8.)

Claims.

Purchase of claims for fees, etc., by officials of the Government forbidden

under a penalty not exceeding \$1,000. (Feb. 25, 1897.)

Collisions of vessels.

Regulations for preventing collisions upon certain harbors, rivers, and inland waters of the U. S., stated in one act, define a steam vessel as any vessel propelled by machinery, and a vessel under way as a vessel not at anchor or made fast to shore or aground.

Rules concerning lights and signals.

Sound signals for fog, etc.

Speed of ships.

Steering and sailing rules.

Distress signals.

(June 7, 1897.)

Commercial statistics.

Vessel owners, agents, masters, and others required on application of persons in charge of river and harbor improvements to furnish commercial statistics relating to their vessels. (Feb. 21, 1891.)

Compensation. (See *Tidewaters*.)

Condemnation proceedings.

For the acquirement of land, right of way, or material needed to maintain, operate, or prosecute works for the improvement of rivers and harbors, may be instituted by the Secretary of War. Authority given to accept donations of land or material for the maintenance or prosecution of public works. (Apr. 24, 1888.)

Contractors. (See *Public works*.)

Contracts. (See also *Proposals*.)

No contract shall be made except after public advertisement for proposals and only with the lowest responsible bidder upon sufficient security for performance. (June 23, 1867, sec. 2; Mar. 2, 1867, sec. 2; Mar. 3, 1875, sec. 1; Aug. 14, 1876, sec. 1; June 18, 1878, sec. 1; Mar. 3, 1881, sec. 2; July 5, 1884, sec. 3; Aug. 5, 1886, sec. 5; Aug. 11, 1888, sec. 3.)

No contracts to be made except under authority of law or an adequate appropriation for its fulfillment. (May 1, 1880.)

Separate proposals and contracts must be made for each work. All bids and names of bidders to be submitted to Congress. (June 23, 1866, sec. 3; Mar. 2, 1867, sec. 2; June 30, 1868, sec. 2.)

(See also following.)

Two or more works of river and harbor improvement may be contained in the same proposal and contract when such works are situated in the same region and are of the same kind or character. (Sept. 19, 1890, sec. 2.)

When the amount provided for the completion of any project (act of Mar. 3, 1899) under continuing contract is less than the cost estimated by the engineers, proposals for bids shall be invited without further action by Congress. (Mar. 3, 1899, sec. 21.)

Corporations. (See *Government structures.*)

Dams. (See *Bridges, etc.; Locks.*)

Defenses. (See *Fortifications.*)

Injury.—It is a penal offense to injure or destroy harbor defenses or material thereof, or to violate any rule of the War Department for the protection of defenses. Penalty: Fine, imprisonment, or both, at the discretion of the U. S. court. (July 7, 1898.)

Material.—American material is to be preferred, but foreign material, when such is found preferable, may be purchased in limited quantities and shall be admitted free of duty. (Aug. 1, 1894; Mar. 2, 1895; June 6, 1896; Mar. 3, 1897; May 7, 1898; Mar. 3, 1899; May 25, 1900.)

Departments. (See *Supplies.*)

Deposits. (See *Harbors; Refuse.*)

Depths.

Depth of tidal waters defined to mean the depth at mean low water unless otherwise expressed. (Mar. 3, 1899, sec. 1.)

Deterioration. (See *Public works.*)

Dikes. (See *Bridges, etc.; Public structures.*)

Disbursements.

No disbursing officer in the Army shall receive commissions or compensation for disbursements made. (June 23, 1866, sec. 3; Mar. 2, 1867, sec. 3.)

Bonds required from all persons making disbursements, except officers in the Regular Army. (June 23, 1866, sec. 3; Mar. 2, 1867, sec. 3.)

Frequent inquiries to be made by officers of the inspection department of the Army as to the necessity, economy, and propriety of all disbursements by disbursing officers of the Army, and their conformity to the law appropriating the money, and also to the law relating to the manner of keeping accounts and making disbursements. (Apr. 20, 1874.)

Displacement. (See *Tidewaters.*)

Drawbridges.

Failure to open or operate drawbridges across navigable water under rules and regulations prescribed by the Secretary of War shall be punished by fine, or imprisonment, or by both. (Aug. 17, 1894, sec. 5.)

Dredging.

No moneys appropriated for rivers and harbors to be expended for dredging inside of established harbor lines. (July 13, 1892, sec. 5.)

Dumping in harbors (New York harbor).

Supervisor shall designate place for deposits. Permits for deposits to be is-

sued. There shall be a fine and loss of master's license, or suspension, for violation of regulations. Owners, masters, and employees are to be held accountable for violations. Boats shall have name or number and owner's name painted in legible letters on both sides. The supervisor shall appoint inspectors and deputies for the enforcement of this act. Arrests may be made, boats may be seized, and tows may be accompanied by the agents of the supervisor. Gas works and other establishments producing material injurious to the harbor may be entered and inspected. There shall be a penalty for bribing employees. Permits shall be returned within a certain time, properly indorsed, under penalty. (Aug. 17, 1894, sec. 3.)

Employees.

Incapacitated employees.—It is unlawful to establish, under appropriations for the executive, legislative, and judicial departments, a civil pension roll or an honorable service roll, or to exempt officers, clerks, or persons in the public service from existing laws concerning public employment. Annual leaves of absence of thirty days, exclusive of Sundays and legal holidays, however, may be granted. (Feb. 24, 1899.)

Employment. (See *United States officers.*)

Retired officers.—Retired officers of the Army and Navy may be employed under the direction of the Chief of Engineers in connection with improving rivers and harbors, at compensation agreed upon. (June 3, 1896, sec. 7.)

Engineers. (See *Civilian engineers.*)

Examinations. (See *Surveys and examinations.*)

Excavations. (See *River and harbor alterations.*)

Fishing. (See *Channels.*)

Fish ways.

To be provided in all locks and dams built by the United States where such constructions operate to obstruct the passage of fish. (Aug. 11, 1888, sec. 11.)

Fortifications. (See *Defenses.*)

Fortifications may be erected in cases of emergency upon the written consent of the owner of the land upon which such work is to be placed temporarily. (Joint resolution approved Apr. 11, 1898.)

Government structures.

Occupancy of.—The Secretary of War shall present to Congress a list of all piers, wharves, and other structures or property pertaining to river and harbor works belonging to the Government and occupied

by private corporations or persons, with the terms, and date of agreement for such occupancy; and shall make suitable recommendations. (Mar. 3, 1899, sec. 8.)

Government works. (See also *Public works.*)

Unlawful for any persons to use, build upon, alter, deface, destroy, injure, obstruct, or in any manner impair the usefulness of any sea wall, bulkhead, jetty, dike, levee, wharf, pier, boundary mark, gauges, surveying stations, buoys, or other established marks of the United States. (Aug. 14, 1876. Sept. 19, 1890, sec. 9.)

Harbor dumping. (See *Dumping.*)

Harbor lines.

Secretary of War authorized to establish harbor lines within which deposits or debris of mines or stamp works may be deposited when such can be done without injury to navigation. (Aug. 6, 1886, sec. 2.)

Harbor lines shall be established by the Secretary of War, beyond which no wharves or piers shall be extended, or deposits made, except under such regulations as he may prescribe from time to time. (Aug. 11, 1888, sec. 12; amended Sept. 19, 1890, sec. 12.)

Wharves, piers, dolphins, booms, or other structures of any kind prohibited outside of established harbor lines, or in any navigable waters where no such lines have been established, except by permission of the Secretary of War. (Sept. 19, 1890, sec. 7; amended July 13, 1892, sec. 3.)

No money appropriated for the improvement of rivers and harbors to be expended in dredging inside of harbor lines duly established. (July 13, 1892, sec. 5.)

It is unlawful to build any structure beyond the established harbor lines except as approved by the Secretary of War on the recommendation of the Chief of Engineers. (Mar. 3, 1899, sec. 10.)

Harbor lines essential to the protection and preservation of harbors may be established by the Secretary of War, and beyond these lines no piers, wharves, bulkheads, or other structures may be extended; nor shall deposits be made beyond them, except as prescribed by the Secretary of War. When tide water is displaced, compensation by excavation may be required by the Secretary of War. (Mar. 3, 1899, sec. 11.)

The harbor lines of the District of Columbia shall be determined by the Chief of Engineers, U. S. Army, and the Commissioners of the District, subject to the approval of the Secretary of War. (Mar. 3, 1899, sec. 3.)

Harbors. (See *Rivers and Harbors.*)

Deposits in, District of Columbia.—Deposits of ballast, dirt, or such material in waters of the Potomac or its tributaries in the District of Columbia, except for the purpose of making a wharf, unlawful. Deposit of offal likewise unlawful. Penalty for violations, fine or imprisonment, or both. Deposits for improving navigation excepted from this law. (May 19, 1896.)

High water. (See *Navigable waters.*)

Holidays.

Labor Day, the first Monday in September of each year, made a public holiday. (June 28, 1894.)

Injury. (See *Navigation, work for improvement of; Public structures; Structures.*)

Jetties. (See *Structures.*)

Labor. (See *Public works.*)

Eight hours shall constitute a day's work for all laborers, workmen, and mechanics employed by or on behalf of the U. S. (June 25, 1888.)

Limited to eight hours in any one calendar day for all laborers or mechanics employed by the Government, or by any contractor upon any public work of the U. S. (Aug. 1, 1892.)

Land. (See *Condemnation proceedings.*)

Acquirement of, for sites of public works.

Laws. (See *Navigable waters.*)

Laws relating to preservation and protection of rivers and harbors.—Legal proceedings against violators of the laws for the preservation and protection of river and harbor works and improvements shall be conducted by the Department of Justice; U. S. district attorneys shall vigorously prosecute all offenders whenever requested to do so. The officers and agents of the U. S. in charge of river and harbor improvements, and the assistant engineers and inspectors employed under them, and the U. S. collectors of customs and other revenue officers, shall have power and authority to swear out process and to arrest and take into custody, with or without process, violators of the aforesaid laws. No official can make an arrest without process unless he has witnessed the violation, and the prisoner must be examined at once before a commissioner, judge, or court of the U. S. (Mar. 3, 1890, sec. 17.)

Leasing public property.

Authorized by the Secretary of War, under certain conditions. (July 28, 1892.)

Levees. (See *Public structures.*)

Locks and dams.

Locks and dams built by the U. S., and which operate as obstructions to the passage of fish, shall be provided with suitable fish ways. (Aug. 11, 1888, sec. 11.)

Materials. (See *Condemnation proceedings; Public works.*)

Acquirement of, for public works.

Mechanics. (See *Labor.*)

Mining deposits.

May be deposited within lines established by the Secretary of War, where such can be done without injury to navigation. (Aug. 5, 1886, sec. 2.)

Moneys. (See *Public moneys and Disbursements.*)

Navigation. (See *Harbors; Rafting.*)

Regulation of.—The Secretary of War shall prepare and enforce rules and regulations for regulating navigation (steamboats, rafts, etc.) on navigable waters of the U. S., giving public notice of the establishment of the rules and regulations; violations thereof may be punished by fine, imprisonment, or by both. (May 9, 1900, sec. 2.)

Works for improvement of.—Masters, pilots, engineers, or persons acting as such, who shall destroy or injure, by towing prohibited material or otherwise, works for improving navigation, shall have their licenses revoked or suspended, and may be fined or imprisoned also. (Aug. 17, 1894, sec. 7.)

Boats violating laws for preserving the works for improving navigation may be libeled for the pecuniary penalties provided for the violations. (Aug. 17, 1894, sec. 8.)

Navigable waters. (See *Bridges; Obstructions; Refuse; Rivers and harbors.*)

Excavation, filling, or any alteration or modification of the natural capacity of any navigable waters of the U. S. prohibited, except by the authority of the Secretary of War. (Sept. 18, 1890, secs. 7, 9, 10, 11; amended July 13, 1892, sec. 3.)

Obstruction of navigable waters by deposits or constructions forbidden, except by authority of the Secretary of War. (Sept. 19, 1890, secs. 6, 7, 10, 11.)

Custody of navigable waters by officers and agents of the U. S. (Sept. 19, 1890, sec. 11.)

All structures declared unlawful which, without permission of the Secretary of War, obstruct or impair navigation, commerce, or anchorage in any navigable waters of the U. S. outside of established harbor lines, or where no harbor lines are or may be established. (Sept. 19, 1890, sec. 7; amended July 13, 1892, sec. 3.)

Laws.—Compilation of existing laws enacted from time to time by Congress for the maintenance, protection, and preservation of the navigable waters of the U. S., and draft of an act embodying such revision and enlargement of the aforesaid laws as the experience of the Corps of Engineers has shown to be advantageous to the public interest. (Annual reports of the Chief of Engineers, 1897, p. 4138.)

Bridges injuring channels or banks of rivers.

Removal of wrecks.

Bridges obstructing navigation.

Construction of piers, bridges, etc.

Depositing material in navigable waters.

Unlawful obstructions forbidden and penalties prescribed.

Method of enforcing laws forbidding obstructions to navigation.

Injuries to Government piers, etc.

Harbor lines.

Opening of drawbridges.

Regulations for canals.

The term "navigable waters" (Alaska) held to include all tidal waters up to the line of ordinary high tide, and all non-tidal waters navigable in fact up to the line of ordinary high-water mark. (May 14, 1898.)

Improvements of.—Violation of laws for the preservation of river and harbor works may be punished by fine or imprisonment, or both, at the discretion of the court. (Mar. 3, 1899, sec. 12.)

Unlawful structures.—Structures erected in navigable waters in violation of law may be removed under injunction of any circuit court having jurisdiction, and the proceedings may be begun by the Attorney-General. (Mar. 3, 1899, sec. 12.)

Obstructions. (See *Channels; Wrecks.*)

The creation of any obstruction in navigable waters is unlawful. (Mar. 3, 1899, sec. 10.)

Vessels shall not be anchored so as to be obstructions in any navigable water, nor shall vessels, timber, etc., be voluntarily or carelessly sunk, on pain of a penalty. (Mar. 3, 1899, sec. 15.)

Wrecks, etc.—Wrecks that have endangered or obstructed navigation for more than thirty days, or when such wrecks have been abandoned, may be removed, after reasonable notice, by the Secretary of War, and any money received from the sale of the wreck or from any contractor that has made the most advantageous offer for the removal of the wreck shall be placed in the Treasury.

Proposals for removal shall be advertised for a reasonable time publicly in a newspaper nearest the place of the wreck.

The contract must be awarded to the bidder offering the most advantageous terms to the U. S.

(Act Mar. 3, 1899, sec. 19.)

Boats, etc., sunk or grounded.—The Secretary of War or his agent may take immediate possession of any craft, in a condition or in a situation such as to stop, seriously interfere with, or to especially endanger navigation in the opinion of the Secretary of War or his agent, and he may remove or destroy the craft as much as is necessary to restore navigation. A written notice that such action will be taken may be given. The expense of the removal shall be a charge against the craft and cargo if the expense is not paid by the owners of the craft. (Mar. 3, 1899, sec. 20.)

Piers. (See *Government structures; Harbor lines; Public property; Tide waters.*)
Use, occupation, or injury of piers or wharves belonging to the U. S. prohibited.

Plant. (See *Public structures.*)

Property returns.

Only certificates of loss are to be forwarded to the Treasury accounting officers, and the effect of such certificate shall be the same as if the facts set forth therein had been ascertained by the Treasury officials when accounting. The manner of making returns to the bureau or department concerned not affected by this act except as provided above. The officer or agent shall, however, have an opportunity to relieve himself from liability. (Mar. 29, 1894.)

Proposals. (See also *Contracts.*)

The Secretary of War authorized to prescribe rules and regulations for the preparation and submission of proposals, with condition that the bidder shall enter into contract if bid is accepted within sixty days, and that no bid can be withdrawn during such time. (Apr. 10, 1878; June 14, 1880, sec. 1; Mar. 3, 1881, sec. 2.)

Public moneys. (See also *Disbursements.*)

Shall not be expended on any site or land for public works hereafter until the validity of the title thereto is established and the consent of the State legislature given to the purchase. Attorney-General to examine titles to all lands or sites purchased by the U. S. (Sept. 11, 1841.)

Public Printer.

Annual reports of the Chief of Engineers and subordinate engineers to be placed in the hands of the Public Printer on or before Oct. 15 of each year, and such reports shall be printed on or before the first Monday of December of each year. (Aug. 11, 1888, sec. 8.)

Public property.

The Secretary of War to report to Congress all cases where piers, breakwaters, or other constructions built by the U. S.

in aid of commerce or navigation are used, occupied, or injured by a corporation or individual. (July 5, 1884, sec. 2; Aug. 5, 1886, sec. 4.)

The Secretary of War authorized to lease public property under certain conditions. (June 28, 1892.)

The embezzlement, stealing, or purloining of any money, goods, chattels, record, voucher, or other valuable property of the U. S. declared a felony, with provision for the punishment of the same. (Mar. 3, 1875.)

Public structures, plant, etc.

Using, defacing, injuring, destroying, or impairing the usefulness of levees, dikes, walls, plant, or public structures forbidden, but the Secretary of War may grant permission for the occupancy, at his discretion, of any public structure when such use will not be injurious to the public interest. (Mar. 3, 1899, sec. 14.)

Public works. (See *Repairs.*)

Labor on, limited to eight hours per day for laborers, mechanics, and workmen. (June 25, 1868; Aug. 1, 1892.)

Protection of breakwaters, piers, and other public property against injury or trespass. (Aug. 14, 1876; Sept. 19, 1890, sec. 9.)

Material required for construction of public works and found on bars and islands, or adjacent to said works, may be taken under certain provisions. (July 5, 1884, sec. 6; Apr. 24, 1888.)

No public work to be deemed as entered upon until appropriations therefor shall have been actually made by Congress. (Aug. 11, 1888, sec. 14; Sept. 19, 1890, sec. 18.)

Title to land for public works to be established before any moneys are expended thereon. (Sept. 11, 1841.)

Payment for material and labor for.—Contractors on public works shall furnish penal bond to include security for labor and materials purchased. Action may be brought by the owner of such labor or materials, on this bond, against the contractor, after fully setting forth the facts in the case to the Department. The U. S. shall be at no expense. Security for costs in case of judgment for the defendant shall be required by the court. (Aug. 13, 1894.)

Appropriations.—The Chief of Engineers shall, annually, recommend, at his discretion, discontinuance of appropriations for any river and harbor work that he may deem unworthy of further improvement. (Mar. 3, 1899, sec. 7.)

Deterioration.—The Chief of Engineers shall state annually what deterioration there has been in public works under his charge, together with an estimate of the cost of restoration. (Mar. 3, 1899, sec. 7.)

Rafting.

Loose timber, logs, sack rafts.—Raftings shall not be prohibited in streams where it is the principal method of navigation; it shall, however, be subject to the regulations of the Secretary of War. (May 9, 1900.)

Refuse.

Deposits of.—Deposits of any kind of refuse in navigable waters elsewhere than within the limits defined and permitted by the Secretary of War unlawful, under penalty of fine or imprisonment or both. (Aug. 17, 1894, sec. 6.)

The deposit of refuse in navigable waters is forbidden, but this does not apply to deposits due to improvements of rivers and harbors, nor to deposits permitted by the Secretary of War on the recommendation of the Chief of Engineers. (Mar. 3, 1899, sec. 13.)

Repairs.

Appropriations for river and harbor works may, at the discretion of the Secretary of War, be used for the repair and restoration of works for which the appropriations have been made. (Mar. 3, 1899, sec. 1.)

Reports. (See *Surveys.*)

Annual reports to be made for each work, with statement of plan adopted, expenditures made thereunder, amount and dates of all appropriations, estimate for its entire and permanent completion, with amount that can be profitably expended in the next fiscal year; also collection district of each work, nearest port of entry, light-house or port, amount of revenue collected at nearest port of entry for last fiscal year, amount of commerce and navigation to be benefited by each work. These reports shall be continued until the completion of each work. (June 23, 1866, sec. 2; Mar. 2, 1867, sec. 2.)

Upon surveys and examinations to state all existing facts tending to show the extent to which the general commerce will be promoted by the works of improvement contemplated. (July 27, 1868.)

After the regular or formal report is submitted on any examination or survey, project or work, under way or proposed, no supplemental or additional report or estimate for the same fiscal year shall be made, unless ordered by Congress. (July 13, 1892.)

Annual reports of the Chief of Engineers and subordinate engineers to be placed in hands of Public Printer on or before Oct. 15 of each year, and the Public Printer to cause such reports to be printed on or before the first Monday of December of each year. (Aug. 11, 1888, sec. 8.)

Right of way. (See also *Condemnation proceedings.*)

Acquirement of, for public works.

Rivers and harbors. (See *Government structures; Laws; Public works.*)

River and harbor alterations, excavations, etc.—No excavations, alterations, etc., may be made in navigable waters unless by authority of the Secretary of War on the recommendation of the Chief of Engineers. (Mar. 3, 1899, sec. 10.)

Streams. (See *Rafting.*)

Structures. (See *Government structures; Harbor lines; Navigable waters.*)

For improving navigable waters.—Injuries to jetties, etc., forbidden under penalty of fine, or imprisonment, or both. (Aug. 17, 1894, sec. 6.)

Supplies. (See *Departments; Advertisements.*)

Supplies for Executive Departments.—Advertisements for all departments to be on the same day, and time for opening bids to be the same. They are to be submitted to a board for approval. Rejected bids are to be readvertised. (Jan. 27, 1894.)

Surveys.

No survey shall be made of any harbor or river until the Chief of Engineers shall have directed a preliminary examination of the same by the local engineer; and such local engineer shall report whether, in his opinion, such work is worthy of improvement, with all facts and reasons for such opinion; whereupon the Chief of Engineers shall direct the survey to be made, if, in his opinion, the river or harbor be worthy of improvement by the General Government. (Aug. 2, 1882; July 5, 1884; Aug. 11, 1888, sec. 14; Sept. 19, 1890, sec. 18; July 13, 1892, sec. 7.)

Reports on surveys and examinations to state all existing facts tending to show the extent to which the general commerce will be promoted by the works of improvement contemplated. (July 27, 1868.)

The reports of the engineers making preliminary examinations shall say whether the improvement should be undertaken by the Government, giving reasons therefor, the magnitude of the commerce, existing and prospective, and estimate of cost of surveying. The Chief of Engineers shall present his views with the report. The reports, when received by the House of Representatives, to be printed. (Aug. 17, 1894, sec. 11.)

Surveys and examinations.

After the regular or formal report on any examination, survey, project, or work under way or proposed is submitted, no supplemental or additional report or estimate for the same fiscal year shall be made unless ordered by a concurrent resolution of Congress. (June 3, 1896, sec. 4; March 3, 1899, sec. 2.)

Preliminary examinations shall be made embracing information concerning commercial importance of river or harbor, and report as to advisability of improvement. If improvement is not deemed advisable, no further action shall be taken without direction of Congress. If river or harbor is reported to be worthy of improvement, the Secretary of War may cause survey to be made, and cost of improvement to be estimated and reported to Congress. (Mar. 3, 1899, sec. 22.)

Tidal waters. (See *Depths; Navigable waters.*)

Tidewater. (See *Harbor lines.*)

Displacement.—The Secretary of War shall require compensation by the establishment, under his supervision, of a compensating basin, or otherwise, when there is displacement of tidewaters by the authorized advancing of piers, or by the deposits of material. (Aug. 17, 1894, sec. 9.)

United States officers. (See *Employees.*)

No disbursing officer in the Army shall receive commissions or compensation for disbursements made. (June 23, 1866, sec. 3. Mar. 2, 1867, sec. 3.)

Unnavigable streams.

Cuivre River declared unnavigable. (Mar. 23, 1900.)

Vessel owners.

Required to furnish commercial statistics on application of persons in charge of river and harbor improvements. (Feb. 21, 1891.)

Vessels. (See *Collisions; Obstructions; Wrecks.*)

Walls. (See *Public structures.*)

Wharf. (See *Harbors.*)

Wharf property, District of Columbia.

Commissioners shall have control of wharf property and shall provide regulations governing and controlling the property, but certain wharf property shall be controlled by the Chief of Engineers. (Mar. 3, 1899.)

Wharves. (See *Government structures; Harbor lines.*)

Wrecks. (See *Obstructions.*)

Provision for the removal of wrecks obstructing or endangering navigation, and the sale of parts of cargo or vessel having a salable value. (June 14, 1880, sec. 4.)

Amended so as to provide for sale and disposal of any wreck or property therein before the raising or removal thereof. (Aug. 2, 1882.)

All wrecks of vessels and other obstructions to navigation which may have been permitted by the owners thereof, or the parties by whom they were caused, to remain to the injury of commerce or navigation for a period longer than two months shall be subject to be broken up and removed by the Secretary of War, without liability for any damage to the owners of the same. (Sept. 19, 1890, sec. 8.)

It shall be the duty of the owner or owners of a sunken vessel or other craft to mark at once the obstruction by day and by night until the wreck be removed or abandoned.

Failure to at once begin the removal and complete the removal of a sunken craft shall be deemed an abandonment of the wreck, which shall then be removed by the U. S. (Mar. 3, 1899, sec. 15.)

MISCELLANEOUS INDEX.

NOTE.—This index is intended to cover briefly the data contained in the portions of the reports of the Chief of Engineers which is entitled "Miscellaneous."

CONTENTS.

- A.—District of Columbia.
- B.—Surveys, explorations, and reconnaissances (including Great Lakes' survey).
- C.—Yellowstone National Park.
- D.—Miscellaneous matter.

PART A.—DISTRICT OF COLUMBIA, WASHINGTON, POTOMAC RIVER AND VICINITY.

NOTE.—The following subjects are contained in this part:

1. Public buildings and grounds, including Washington Monument (improvement and care).
2. Road from Aqueduct Bridge to Mount Vernon, Va.
3. Bridge in line with Massachusetts avenue.
4. Fishways at Great Falls (erection of).
5. Memorial Bridge, Potomac River.
6. Dalecarlia Receiving Reservoir (improvement and care).
7. Intersection of K and Sixteenth streets (sale of lots).
8. Repair of Aqueduct Bridge, Potomac River.
9. Rock Creek, bridge in line of Massachusetts avenue extended.
10. Telegraph and telephone connection of the White House and the departments.
11. Washington Monument.
12. Water supply, 48-inch main.
13. Water supply (increasing).
14. Water supply (investigation of).
15. Washington Aqueduct, D. C.
16. Washington Aqueduct, D. C., filtration plant.

A.1.—District of Columbia—Public Buildings and Grounds, including Washington Monument (improvement and care).^a

Engineers.

<p>CHIEF OF ENGINEERS. Reports, 67, 52; 68, 74; 69, 65; 70, 84; 71, 100; 72, 98; 73, 109; 74, 120; 75, 126; 76, 116, 77, 124; 78, 139; 79, 183; 80, 243; 81, 334; 82, 324; 83, 339; 84, 344; 85, 374;</p>	<p>86, 368; 87, 336; 88, 312; 89, 381; 90, 349; 91, 444; 92, 418; 93, 480; 94, 435; 95, 491; 96, 437; 97, 542; 98, 546; 99, 632; 1900, 710.</p> <p>ENGINEERS IN CHARGE: Maj. N. Michler (Bvt. Brig. Gen.).</p>
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^aIn addition, the office was charged at 1900 with—
Care and repair of the Government telegraph lines connecting the Capitol with the various Departments and the Government Printing Office.

Repair and improvement of the Government Printing Office.

Repair of the building on Tenth street NW., where Abraham Lincoln died.

Construction of the statue of Gen. J. A. Logan.

Care of such matters connected with the erection of the statue of Gen. Sherman as properly devolved upon the War Department.

Care of the monument at Wakefield, Va.

Care of the birthplace of Washington.

Care of the iron-pile dock erected under the supervision of the office in 1894, under the direction of the Department of State, at the mouth of Bridge Creek, Va.

The erection in the National Military Park at Gettysburg, Pa., of the memorial tablet to Abraham Lincoln.

Preservation, care, and safety of buildings occupied by the War Department in the District, except State, War, and Navy Department building.

Care of the banks of the Potomac River from the north line of the Arsenal grounds to the southern curb line of N street.

The work, since June 15, 1900, of continuing plans for extending the Executive Mansion.

The work, since June 20, 1900, of making an examination and reporting plans for the treatment of that section of the District situated south of Pennsylvania avenue and north of B street SW., and for a suitable connection between the Potomac and Zoological parks.

**PART A.—DISTRICT OF COLUMBIA, WASHINGTON,
POTOMAC RIVER AND VICINITY—Continued.**

A1.—District of Columbia—Public Buildings and Grounds, including Washington Monument (improvement and care)—Continued.

Reports, 67, 519, 532^a, 544^b; 68, 889, 913^c; 69, 493, 498^d, 517^e; 70, 517, 530^f; 71, 974.

Maj. O. E. Babcock. Reports, 71, 967; 72, 1010, 1025^g; (Col.) 73, 1151; 74, ii, 385; 75, ii, 800; 76, ii, 675; 77, ii, 1061.

Lt. Col. T. L. Casey. Reports, 77, ii, 1072; 78, ii, 1345; 79, ii, 1877; 80, 2339.

Lt. Col. A. T. Rockwell. Reports, 80, 2339; (Col.) 81, 2711; 82, 2733; 83, 2093; 84, 2339.

Lt. Col. J. M. Wilson. Reports, 85, 2503; 86, 2075; 87, 2569; 88, 2749, 2769; 89, 2827.

Col. O. H. Ernst. Reports, 90, 3535; 91, 3907; 92, 3385.

Col. J. M. Wilson. Reports, 93, 4313; 94, 3265^h; 95, 4129; 96, 3975; 97, 4025.

Col. T. A. Bingham. Reports, 98, 3661ⁱ; 99, 3811; 1900, 5227.

ASSISTANT. Lt. J. S. Sewell. Report, 96, 4004^j.

Legal proceedings.

Draft of act to regulate use of public parks and reservations, 97, 4062.

Legal status of the office of public buildings and grounds, 1900, 5273. Line of legal existence. Line of existence of a purely local government of city of Washington, and of a local city surveyor, 1900, 5280; officials, line of, 1900, 5280.

Shrubs.

Vegetation, trees, etc., 67, 538; 90, 3556; 1900, 5286; Executive Mansion, 1900, 5245.

A2.—District of Columbia—Road from Aqueduct Bridge to Mount Vernon, Va.

Appropriation.

Feb. 23, 1889, \$10,000.

Engineers.

CHIEF OF ENGINEERS. Reports, 89, 385; 90, 350; 99, 42; 1900, 43.

ENGINEER IN CHARGE. Lt. Col. C. P. Hains. Reports, 89, 2867; 90, 3563.

ASSISTANT. B. F. Mackall. Report, 90, 3571.

A3.—Potomac River (Anacostia River), D. C.—Bridge in line with Massachusetts avenue.

Engineers.

CHIEF OF ENGINEERS. Reports, 96, 430; 98, 541.

ENGINEERS IN CHARGE:

Maj. C. E. L. B. Davis. Report, 96, 3890.

Lt. Col. C. J. Allen. Report, 98, 3598.

A4.—Potomac River—Fishways at Great Falls (erection of).

Appropriations.

1882, \$50,000, act July 15.

1888, 25,000, act Feb. 1.

1892, 15,000, act Aug. 5.

Total, 90,000

Engineers.

CHIEF OF ENGINEERS. Reports, 83, 339; 84, 344; 85, 374; 86, 368; 87, 385; 88, 312; 89, 380; 90, 348; 91, 443; 92, 417; 93, 479; 94, 435; 95, 489.

ENGINEERS IN CHARGE:

Maj. G. J. Lydecker. Reports, 83, 2092; 84, 2311; 85, 2499; 86, 2061; 87, 2564; 88, 2766.

Lt. Col. J. M. Wilson. Report, 89, 2825.

Lt. Col. G. H. Elliot. Reports, 90, 3532; 91, 3905; (Col.) 92, 3382; 93, 4310; 94, 3224.

Maj. J. G. D. Knight. Report, 95, 4114.

ASSISTANT. Capt. T. W. Symons. Reports, 84, 2312; 85, 2500; 86, 2063.

^a Public park and site of Presidential Mansion.

^b Foreign paving.

^c Survey, Potomac River in District of Columbia.

^d Washington Canal, Tiber Creek.

^e Probable damage to Georgetown or Virginia channel from repair of railroad bridge.

^f Examination of Potomac.

^g Description of grounds.

^h Including list of U. S. reservations in Washington.

ⁱ Erection of Government Printing Office.

^j Including records of movement of Washington Monument; changes in ironwork.

**PART A.—DISTRICT OF COLUMBIA, WASHINGTON,
POTOMAC RIVER AND VICINITY—Continued.**

A5.—Potomac River—Memorial bridge across.

Appropriation.

1899, \$5,000.

CHIEF OF ENGINEERS. Report, 98, 540;
99, 42, 627; 1900, 43, 704.

BOARD OF ENGINEERS. Board of Engineers and of architects upon certain designs for a memorial bridge across Potomac River from Washington, D. C., to Arlington, Va., ordered by act of Feb.

5, 1900. Report, 1900, 5128. (Lt. Col. C. J. Allen, Maj. T. W. Symons, Capt. D. D. Gaillard, and Stanford White and Jas. G. Hill.)

ENGINEER IN CHARGE. Lt. C. J. Allen. Reports, 98, 3573; 99, 3778; 1900, 5125.

DESIGNERS AND ARCHITECTS. W. H. Barr, W. R. Hutton, L. L. Burk, and G. S. Morison. Report, 1900, 5148.

A6.—Washington, D. C.—Dalecarlia Receiving Reservoir (improvement of).

Appropriations.

1893, \$80,000, act Mar. 3.

1894, 52,500, act Aug. 7.

1895, 37,500, act Mar. 2.

Total, 150,000

Engineers.

CHIEF OF ENGINEERS. Reports, 95, 489;
96, 436.

ENGINEER IN CHARGE. Col. G. H. Elliot. Reports, 95, 4121; 96, 3971.

A7.—Washington, D. C.—Intersection of K and Sixteenth streets (sale of lots).

Engineers.

CHIEF OF ENGINEERS. Report, 81,
335.

A8.—Washington, D. C.—Repair of Aqueduct Bridge across the Potomac River.

Appropriations.

1895, \$51,070, 95, 4099.

1896, 65,000, 96, 3886.

Total, 116,070

96, 429; 97, 536; 98, 539; 99, 626; 1900, 703.

ENGINEERS IN CHARGE:

Maj. C. E. L. B. Davis. Report, 95,
4085.

Lt. Col. C. J. Allen. Report, 96, 3883;
97, 3987; 98, 3571; 99, 3777; 1900, 5123.

Engineers.

CHIEF OF ENGINEERS. Report, 95, 484;

A9.—Washington, D. C.—Rock Creek, bridge in line of Massachusetts avenue extended.

Engineers.

CHIEF OF ENGINEERS. Report, 98,
541.

ENGINEER IN CHARGE. Capt. D. D. Gaillard. Report, 98, 3606.

A10.—Washington, D. C.—Telegraph and telephone connection of the White House and the Departments.

Engineers.

CHIEF OF ENGINEERS. Reports, 88,
313; 98, 547; 99, 633; 1900, 710.

ENGINEERS IN CHARGE:

Lt. Col. J. M. Wilson. Reports, 88,
2794; 89, 2845.

Col. O. H. Ernst. Report, 90, 3549.
Capt. T. A. Bingham. Reports, 98,
3734, 3743; (Col.) 99, 3838, 3842; 1900,
5262.

A11.—Washington, D. C.—Washington Monument. (See Public buildings.)

Engineers.

CHIEF OF ENGINEERS. Reports, 99,
632; 1900, 710.

**PART A.—DISTRICT OF COLUMBIA, WASHINGTON,
POTOMAC RIVER AND VICINITY—Continued.**

A12.—Washington, D. C.—Water supply, 48-inch main.

Appropriation.

Mar. 2, 1889, \$575,000.

Engineers.

CHIEF OF ENGINEERS. Reports, 89, 378; 90, 346; 91, 441; 92, 416.

ENGINEERS IN CHARGE:

Lt. Col. J. M. Wilson. Report, 89, 2820.

Lt. Col. G. H. Elliot. Reports, 90, 3522; 91, 3897; 92, 3380.

A13.—Washington, D. C.—Water supply (increasing). (See *Washington Aqueduct*.)

Appropriations.

July 15, 1882, \$1,485,279.30

July 7, 1884, 87,500.00

Mar. 3, 1885, 87,500.00

Mar. 28, 1886, 5,000.00

Aug. 4, 1886, 555,000.00

Mar. 30, 1888, 355,000.00

Mar. 2, 1895, ^a125,000.00

Mar. 3, 1897, 200,000.00

June 30, 1898, 594,421.00

June 6, 1900, 139,034.34

Total, 3,633,734.64

Engineers.

CHIEF OF ENGINEERS. Reports, 83, 338; 84, 343; 85, 373; 86, 366; 87, 334; 88, 310; 89, 378; 90, 348; 91, 442; 92, 416; 93, 478; 94, 434; 95, 487; 96, 433; 97, 540; 98, 545; 99, 629; 1900, 707.

BOARDS OF ENGINEERS.

Convened by S. O. 107, July 15, 1885, to consider project of Maj. Lydecker for diversion of 3 small streams across the reservoir site. Report, 85, 2497. (Col. T. L. Casey, Lt. Col. W. P. Craighill, Maj. G. J. Lydecker.)

Board for consideration of a tunnel for aqueduct extension. Report, 87, 2546. (Col. J. C. Duane, Lt. Col. H. L. Abbot, Lt. Col. C. B. Comstock, Lt. Col. W. McFarland.)

Commission of Experts on tunnel construction. Report, 96, 3932. (Maj. W.

L. Marshall; Capt. J. L. Lusk; A. Fteley, C. E.; D. Fitzgerald, C. E.; Capt. D. D. Gaillard.)

ENGINEERS IN CHARGE:

Maj. G. J. Lydecker. Reports, 83, 2080; 84, 2301; 85, 2469; 86, 2043; 87, 2535; 88, 2755.

Lt. Col. J. M. Wilson. Report, 89, 2817.

Lt. Col. G. H. Elliot. Reports, 90, 3531; (Col.) 91, 3904; 92, 3380; 93, 4309; 94, 3222.

Maj. J. G. D. Knight. Reports, 95, 4111; 96, 3950^b, 3944^c.Capt. D. D. Gaillard. Reports, 96, 3925; 96, 3029^d; 97, 4018.

Capt. T. A. Bingham. Report, 98, 3658.

Lt. Col. A. M. Miller. Reports, 99, 3797; 1900, 5208.

ASSISTANTS:

Capt. T. W. Symons. Report, 85, 2478.

Lt. C. McD. Townsend. Reports, 86, 2819; 87, 2557; 88, 2764; 89, 2820.

T. B. Main and A. J. Sparrow. Report, 96, 2942^e.

Gen. M. C. Meigs. Report, 96, 3949.

R. S. Smead. Report, 1900, 5217^f.Lt. G. M. Hoffman. Report, 1900, 5221^g.Capt. Hoxie. Report, 85, 2085^h.

A14.—Washington.—Water supply (Investigation of).

Appropriations.1898, \$3,000 } 99, 3809; 1900, 5224.
1899, 5,000 }

Total, 8,000

Engineers.

CHIEF OF ENGINEERS. Reports, 97, 540; 98, 545; 99, 631; 1900, 709.

ENGINEER IN CHARGE. Capt. A. M. Miller. Reports, 98, 3658; (Lt. Col.) 99, 3808; 1900, 5224.

^a Raising dam at Great Falls.^b On feasibility and propriety of completing the tunnel conduit.^c On abandonment of incomplete aqueduct tunnel, views on.^d Testing tunnel conduit, and on feasibility and propriety of completing the conduit.^e Examination of tunnel.^f Views on proposed abandonment of aqueduct tunnel.^g Tunnel.^h Reservoir air shafts.ⁱ Examination, extension of aqueduct.

**PART A.—DISTRICT OF COLUMBIA, WASHINGTON,
POTOMAC RIVER AND VICINITY—Continued.**

**A15.—Washington Aqueduct, D. C. (See Washington, D. C.—Increasing
water supply.)**

Appropriations.*

Sept. 30, 1850,	\$500
Aug. 31, 1852, <i>a</i>	5, 000
Mar. 3, 1853,	100, 000
Mar. 3, 1855,	250, 000
Aug. 18, 1856,	250, 000
Mar. 3, 1857,	1, 000, 000
June 12, 1858,	800, 000
June 25, 1860,	500, 000
July 4, 1864,	150, 000
July 28, 1866,	142, 584
Dec. 20, 1866,	12, 000
Mar. 2, 1867,	20, 000
July 25, 1868,	52, 500
Mar. 3, 1869,	25, 000
July 15, 1870, <i>b</i>	120, 822
Mar. 3, 1871,	114, 196
June 10, 1872,	70, 555
Jan. 23, 1873,	14, 000
Mar. 3, 1873,	43, 600
June 23, 1874; <i>d</i>	36, 400
Mar. 3, 1875,	28, 000
July 31, 1876,	22, 000
Mar. 3, 1877,	15, 000
June 20, 1878,	15, 000
Mar. 3, 1879, <i>e</i>	20, 000
June 4, 1880, <i>f</i>	20, 000
Mar. 3, 1881,	20, 000
July 1, 1882, <i>g</i>	20, 000
Mar. 3, 1883,	20, 000
July 5, 1884,	20, 000
Feb. 25, 1885,	20, 000
July 9, 1886,	20, 000
Mar. 3, 1887,	20, 000
July 18, 1888, <i>h</i>	20, 000
Mar. 2, 1889, <i>i</i>	20, 000
Aug. 6, 1890, <i>j</i>	25, 500
Mar. 3, 1891, <i>k</i>	20, 000
July 14, 1892,	20, 000
Mar. 3, 1893,	80, 000
Aug. 7, 1894, <i>m</i>	82, 500
Mar. 2, 1895, <i>n</i>	71, 500
June 11, 1896, <i>o</i>	25, 000
Mar. 3, 1897, <i>p</i>	26, 000
June 30, 1898,	22, 000
Mar. 3, 1899,	25, 000

Total, 4, 402, 657

Engineers.

CHIEF OF ENGINEERS. Reports, 67, 52;
68, 74; 69, 65; 70, 84; 71, 99; 72, 98;
73, 109; 74, 120; 75, 126; 76, 116; 77,

124; 78, 139; 79, 184; 80, 243; 81, 334;
82, 324; 83, 338; 84, 342; 85, 372; 86,
365; 87, 333; 88, 310; 89, 378; 90, 345;
91, 436; 92, 413; 93, 475; 94, 432; 95,
485; 96, 430, 3932; 97, 537; 98, 542;
99, 629; 1900, 705.

BOARDS OF ENGINEERS:

Commission of experts on aqueduct
tunnel. Report, 96, 3932. (Maj. W. L.
Marshall, Capt. J. L. Lusk, and Capt. D.
D. Gaillard, Corps of Engineers; A. Fteley
and D. Fitzgerald, civil engineers.) Re-
ports of others on the subject: Col. G. H.
Elliot, (retired), 96, 3944. Gen. M. C.
Meigs, 96, 3949. Maj. J. G. D. Knight,
96, 3950. T. B. Main and A. J. Sparrow,
96, 3942.

ENGINEERS IN CHARGE:

Under War Department—

Capt. M. C. Meigs, 1852-60.
Capt. H. W. Benham, 1860.
Lt. J. St. Clair Morton, 1860-61.
Gen. M. C. Meigs, 1861-62.

Under Department of the Interior—

W. R. Hutton, 1862-63.
S. Seymour, 1863-65.
T. B. Samo, 1865-67.

Under War Department—

Maj. N. Michler (Bvt. Brig. Gen.).
Reports, 67, 548; 68, 904; 69, 502, 515
(History of improvement); 70, 522; 71,
974.

Maj. G. H. Elliot. Report, 71, 948.
Maj. O. E. Babcock. Reports, 72,
1019; (Col.) 73, 1162; 74, ii, 397; 75,
ii, 814; 76, ii, 691; 77, ii, 1061, 1071,
1093†.

Lt. Col. T. L. Casey. Reports, 77, ii,
1089; 78, ii, 1350; 79, ii, 1885; 80, 2344,
2357‡; 81, 2703; 82, 2729.

Maj. G. J. Lydecker. Reports, 83,
2077; 84, 2299; 85, 2453; 86, 2013; 87,
2527; 88, 2749.

Lt. Col. J. M. Wilson. Reports, 89,
2809.

Lt. Col. G. H. Elliot. Reports, 90,
3501; 91, 3875; 92, 2349; (Col) 93,
4275; 94, 3193§; 95, 4119||.

Maj. J. G. D. Knight. Report, 95,
4101.

Capt. D. D. Gaillard. Reports, 96,
3902§, 3905; 97, 3991; 98, 3642||.

*NOTE.—Reverted to the Treasury: (a) \$2.81, (b) \$46.25, (c) \$560.87, (d) 35 cents, (e) \$1,109.87, (f) \$381.06, (g) \$1,364.17, (h) \$2,264.34, (i) \$4.12, (j) \$5,500, (k) \$2.49, (m) \$39.96, (n) \$2,963.87, (o) \$285.85, (p) \$1,828.58, \$4.38 from regular appropriation for Washington Aqueduct, and \$1,824.15 from appropriation for constructing telephone line; total, \$16,866.54. Since 1878 one-half of the amounts appropriated has been contributed by the U. S. and the other half by the District of Columbia.

† Letters of Gen. M. C. Meigs concerning criticism of Rock Creek bridge, and of Boards of Engineers, and of Lt. Col. Casey.

‡ Improvement of water supply; letter to Senate.

§ Including filtration, and advisability of using Great Falls for water power.

|| List of mains laid in the District.

¶ Examination of aqueduct tunnel.

**PART A.—DISTRICT OF COLUMBIA, WASHINGTON,
POTOMAC RIVER AND VICINITY—Continued.**

A15.—Washington Aqueduct, D. C.—Continued.

Col. T. A. Bingham. Report, 98, 3625.

Lt. Col. A. M. Miller. Reports, 99, 3781; 1900, 5193.

ASSISTANTS:

T. B. Sambo. Reports, 68, 907; 99, 503; 70, 524; 71, 955; 80, 2350.

Capt. T. W. Symons. Report, 85, 2456.

Legislation.

Laws relating to the aqueduct, 71, 956.

Miscellaneous.

Each annual report, principally in later years, covers the condition of the reservoirs, conduits, bridges, and mains, the consumption and waste of water, the condition of the water during the year, and the daily gauge pressures.

A16.—Washington Aqueduct, D. C.—filtration plant.

Appropriations.

1900, \$200,000, 1900, 5224.

Engineers.

CHIEF OF ENGINEERS. Report, 86, 365; 98, 545; 1900, 709.

ENGINEERS IN CHARGE:

Maj. G. J. Lydecker. Report, 86, 2021.

Col. G. H. Elliot. Reports, 94, 3203^a; 98, 3650.

Lt. Col. A. M. Miller. Report, 1900, 5224.

ASSISTANTS:

Capt. T. W. Symons. Report, 86, 2021.

Capt. D. D. Gaillard. Report, 98, 3640.

PART B.—EXPLORATIONS, SURVEYS, AND RECONNOISSANCES.

NOTE.—The following subjects are contained in this part:

1. Arizona, Department of.
2. California, Department of.
3. California and Oregon.
4. Colorado, Department of.
5. Colorado (Denver), Kansas (Fts. Hays and Wallace), and California (Pueblo)—Latitude and longitude.
6. Colorado River of the West.
7. Columbia, Department of.
8. Dakota, Department of.
9. Detroit, Mich., and Fort Leavenworth, Kans.—Determination of difference of longitude between.
10. Erie Canal—Preservation of bench marks.
11. Fortieth parallel—Geological explorations of.
12. Instruments, mappings, etc.
13. Lake Erie—Shoals in.
14. Lake Erie—Water-level observations.
15. Lake Superior, north shore—Survey and location of dangerous reef near mouth of Gooseberry River.
16. Lava beds (Modoc campaign), Oreg.—Reconnoissance.
17. Maps.
18. Maumee Valley—Historic grounds, locations, and military works (examination of).
19. Mexican frontier.
20. Missouri, Military Department of.
21. Missouri, Military Division of the.
22. New Mexico.
23. Northern and Northwestern Lakes—Correcting and issuing charts—Surveys.
24. Northern and Northwestern Lakes—Annual water levels.
25. Northern and Northwestern Lakes—Charts.
26. Northern and Northwestern Lakes—Gauging outlet.
27. One hundredth meridian.
28. Pacific, Division of the.
29. Philippines, Division of the.
30. Platte, Department of the.
31. Porto Rico, engineering operations in the Department of.
32. Reconnoissances and explorations.
33. Geological and geographical surveys of the War Department.
34. Texas, Department of.
35. Uintah Mountains, Utah.
36. Yukon River, Alaska—Exploration.

B1.—Arizona, Department of.

Engineers.

ENGINEERS IN CHARGE:

Lt. G. M. Wheeler. Report, 72, 1124^b.

Lt. E. D. Thomas, 5th Cav. Report, 77, 1449.

Lt. T. A. Toney, 6th Cav. Report, 78, 1881.

Lt. C. F. Palfray. Report, 80, 2547; 81, 2859; 82, 2847.

Lt. G. J. Fiebeger. Report, 83, 2404.

Lt. T. A. Bingham. Report, 84, 2399; 85, 2531.

^a Various filtration plans.

^b Arizona, Nevada, and Utah.

PART B.—EXPLORATIONS, SURVEYS, AND RECONNOISSANCES—Continued.

B2.—California, Department of.

Engineers.

ENGINEERS IN CHARGE:

Maj. W. A. Jones. Reports, 83, 2402; 84, 2392.

Lt. T. L. Casey. Reports, 85, 2529; 87, 3147.

Lt. C. G. Lyman, 2d Cav., A. D. C. Re-

ports, 92, 3459; 93, 4403; 94, 3453.

Lt. J. L. Sehon, 20th Inf. Report, 95, 4254.

Lt. J. F. Reynolds Landis, 1st Cav., A. D. C. Reports, 95, 4256. 96, 4076.

Lt. J. D. Miley, 5th Art. Reports, 97, 4133; 98, 3783.

B3.—California and Oregon.

Engineers.

CHIEF OF ENGINEERS. Report, 66, ii, 22.

B4.—Colorado, Department of.

Engineers.

CHIEF OF ENGINEERS. Reports, 97, 547; 99, 639; 1900, 718.

ENGINEERS IN CHARGE:

Lt. J. L. Sehon, 20th Inf. Report, 97, 4134.

Lt. J. R. Bennet, 16th Inf. Reports, 99, 3880; (Capt.) 1900, 5451.

B5.—Colorado (Denver), Kansas (Fts. Hays and Wallace), and California (Pueblo).—Latitude and longitude.

Engineers.

CHIEF OF ENGINEERS. Report, 73, 115.

ENGINEER IN CHARGE. Lt. E. H. Ruffner. Reports, 73, 1224, 1243.

ASSISTANT. Prof. T. H. Safford. Report, 73, 1243.

B6.—Colorado River of the West.

Engineers.

CHIEF OF ENGINEERS. Reports, 67, 53, 865; 68, 76, 1195; 69, 68.

ENGINEERS IN CHARGE:

Capt. S. M. Mansfield (Bvt. Lt. Col.). Report, 68, 1188.

Maj. R. S. Williamson (Bvt. Lt. Col.). Report, 68, 1190.

B7.—Columbia, Department of.

Engineers.

CHIEF OF ENGINEERS. Reports, 80, 249; 81, 343; 82, 329; 83, 344; 84, 349; 85, 345; 86, 317; 89, 386; 90, 355; 91, 450; 92, 424; 93, 488; 94, 443; 95, 497; 96, 442; 97, 547; 98, 552; 99, 639; 1900, 718.

ENGINEERS IN CHARGE:

Lt. T. W. Symons. Reports, 80, 2549; 81, 2863; 82, 2851.

Lt. G. W. Goethals. Reports, 83, 2407; 84, 2403.

Lt. W. C. Langfitt. Reports, 87, 3151; 88, 2816.

Lt. L. A. Lovering, 4th Inf. Report, 89, 2878.

Maj. G. J. Lydecker. Report, 90, 3599.

Capt. C. H. Clark, Ord. Dept. Report, 91, 3945.

Maj. T. McCrea, 5th Art. Reports, 92, 3458; 93, 4402; 94, 3452.

Lt. J. L. Sehon, 20th Inf. Reports, 95, 4254; 96, 4074.

Maj. T. H. Barry. Report, 97, 4132.

Lt. J. B. Bennet, 7th Inf. Report, 98, 3784.

Capt. H. P. McCain, 14th Inf. Reports, 99, 3879; 1900, 5450.

ASSISTANTS:

A. Downing. Report, 83, 2410.

Lt. W. C. Brown, 1st Cav. Report, 81, 2873.

PART B.—EXPLORATIONS, SURVEYS, AND RECONNOISSANCES—Continued.**B8.—Dakota, Department of.****Engineers.**

CHIEF OF ENGINEERS. Reports, 67, 53; 74, 123; 75, 131; 76, 123; 77, 130; 78, 147; 79, 189; 80, 247; 81, 340; 82, 328; 83, 343; 84, 348; 85, 377; 87, 345.

ENGINEERS IN CHARGE:

Capt. W. Ludlow. Reports, 74, ii, 626. Reconnoissance, Black Hills, 74, ii, 628; 75, ii, 1113; 76, iii, 569.

Reconnoissance, Ft. Carroll, Mont., to Yellowstone National Park, 76, iii, 570.

Lt. E. Maguire. Reports (Custer massacre), 76, iii, 699; 77, ii, 1337, 1338^a; 78, iii, 1671; 79, 2359; 80, 2509; 81, 2843; (Capt.), 82, 2843.

Lt. H. S. Taber. Reports, 83, 2392; 84, 2387.

Lt. J. Biddle. Reports, 85, 2527; 87, 3149.

ASSISTANTS:

Prof. N. H. Winchell. Geologist and botanist. Reports, 74, ii, 630; 75, ii, 1131, 1172.

G. B. Grinnell. Paleontology and zoology. 74, ii, 632, 633; 75, ii, 1177; 76, iii, 634, 657.

Prof. J. M. Coulter. Report, 75, ii, 1173.

R. P. Whitfield. New fossils. Reports, 75, ii, 1202; 76, iii, 694.

Lt. R. E. Thompson, 8th Inf. Report, 76, iii, 631.

E. S. Dana. Geological report, 76, iii, 657.

Lt. E. J. McClelland, 2d Cav. Report, 77, ii, 1361.

Lt. G. D. Wallace, 7th Cav. 77, ii, 1376^b.

Sergt. J. E. Wilson. Reports, 77, ii, 1378^b; 80, 2530.

Lt. L. R. Hare, 7th Cav. Report, 78, iii, 1672.

Asst. Surg. V. Havard, U. S. A. Botany. Reports, 78, iii, 1681; 80, 2513.

Lt. O. F. Long, 5th Inf. Report, 78, iii, 1688^c.

Topographical Asst. J. J. Durage. Survey, military reservation, Ft. Keogh. Report, 79, iii, 2363.

Lt. W. Hoffman, 11th Cav. Reconnoissance, Moreau, or Owl, River, Dakota. Report, 79, iii, 2367.

A. A. Surg. C. E. McChesney. Mammals and birds. Reports, 79, iii, 2371.

W. W. Payne. Astronomy. Report, 81, 2844.

B9.—Detroit, Mich., and Ft. Leavenworth, Kans.—Determination of difference of longitude between.**Engineers.**

ENGINEER IN CHARGE. Lt. E. H. Ruffner. Report, 72, 1118.

B10.—Erie Canal—Preservation of bench marks.**Engineers.**

CHIEF OF ENGINEERS. Reports, 97, 546; 98, 551; 99, 636; 1900, 715.

ENGINEERS IN CHARGE:

Maj. W. S. Stanton. Reports, 97, 4122; 98, 3778.

Capt. G. D. Fetch. Reports, 99, 3859; 1900, 5402.

B11.—Fortieth Parallel—Geological explorations.**Engineers.**

CHIEF OF ENGINEERS. Reports, 67, 54, 866; 68, 76; 69, 68; 70, 87; 71, 103; 72, 101; 73, 113; 74, 122; 75, 129; 76, 119; 77, 127; 78, 141; 79, 186; 80, 245; 81, 338.

ENGINEER IN CHARGE. Clarence King, geologist. Reports, 71, 1027, 1030; 73, 1203; 74, ii, 477; 75, ii, 919; 76, iii, 217; 77, ii, 1207; 78, iii, 1419.

Examination of so-called diamond fields, 73, 1208.

B12.—Instruments, mappings, etc.**Engineer.**

ENGINEER IN CHARGE. Maj. O. M. Poe (Bvt. Brig. Gen. and Col., A. D. C.).

Reports, 75, ii, 1109; 76, ii, 564; 81, 2811^d; 82, 2825.

^a Expedition against hostile Sioux, 1876.
^b Yellowstone expedition.

^c Journal of marches under Col. N. A. Miller.
^d Progress of railroads in Texas-Mexico.

PART B.—EXPLORATIONS, SURVEYS, AND RECONNOISSANCES—Continued.

B13.—Lake Erie—Shoals in.

Engineers.

CHIEF OF ENGINEERS. Reports, 92, 420; 93, 484; 97, 547.

ENGINEERS IN CHARGE:

Maj. A. Stickney. Report, 92, 3424.

Col. J. A. Smith. Report, 97, 4123.
ASSISTANT. W. T. Blunt. Report, 97, 4125.

B14.—Lake Erie—Water level observations.

Engineers.

CHIEF OF ENGINEERS. Report, 90, 530.
ENGINEER IN CHARGE. Maj. L. C. Liv-
ingstone. Report, 90, 3583.

ASSISTANT. W. T. Blunt, 90, 3584.

**B15.—Lake Superior, north shore of—Survey and location of dan-
gerous reef near mouth of Gooseberry River.**

Engineers.

CHIEF OF ENGINEERS. Report, 90, 530.

ENGINEER IN CHARGE. Maj. J. B.
Quinn. Report, 90, 3583.

B16.—Lava beds (Modoc campaign), Oreg.—Reconnoissance.

Engineers.

CHIEF OF ENGINEERS. Report, 73, 114.

ENGINEER IN CHARGE. Capt. G. J. Ly-
decker. Report, 73, 1219.

B17.—Maps.

Campaigns and battlefields.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, ii, 23; 67, 54; 68, 78; 69, 69; 70, 88; 71, 104; 72, 102; 73, 112; 74, 121; 75, 128; 77, 125; 78, 140; 79, 185; 90, 354.

ENGINEERS IN CHARGE:

Maj. N. Michler (Bvt. Brig. Gen.).
Reports, 68, 1199; 69, 649.

Maj. G. L. Gillespie (Bvt. Lt. Col.).
Reports, 73, 1202; 74, ii, 476.

Lt. Col. G. K. Warren. Report, 79, iii, 1973.

Military, geographical, and lake survey.

Engineers.

CHIEF OF ENGINEERS. Reports, 66, ii, 20; 68, 77; 69, 69; 76, iii, 117, 584; 77, 125; 78, 140; 79, 184; 80, 244; 81, 337; 82, 325.

Military and geographical.

Engineers.

CHIEF OF ENGINEERS. Reports, 83, 341; 84, 345; 85, 375; 86, 371; 88, 316; 89, 385.

Military and other maps.

Engineers.

CHIEF OF ENGINEERS. Reports, 90, 353; 91, 449; 92, 422; 93, 488; 94, 443.

Explorations—Reports and maps, certain omissions.

Engineers.

CHIEF OF ENGINEERS. Reports, 72, 102; 75, 131.

ENGINEERS IN CHARGE:

Col. J. H. Simpson. Report, 72, 1173.
Maj. G. K. Warren (Bvt. Maj. Gen.).
Report, 75, 1240.

B18.—Maumee Valley—Historic grounds, locations, and military works (examination of).

Engineers.

CHIEF OF ENGINEERS. Report, 89, 388.

ENGINEER IN CHARGE. Col. O. M.
Poe. Report, 89, 2869.

B19.—Mexican frontier.

Engineers.

CHIEF OF ENGINEERS. Report, 81, 339.
ENGINEER IN CHARGE. Maj. O. M. Poe

(Bvt. Brig. Gen.; Col., A. D. C.). Re-
ports, 81, 2811; 82, 2825.

PART B.—EXPLORATIONS, SURVEYS, AND RECONNOISSANCES—Continued.**B20.—Missouri, Military Department of.****Engineers.****ENGINEERS IN CHARGE:**

Lt. E. H. Ruffner. Reports, **72**, 1121; **73**, 1221; **74**, ii, 622^a, 625; **75**, ii, 1233; **76**, iii, 718, 724^b; **77**, ii, 1399, 1401^c, 1410^d, 1422^e, 1431^f; **78**, iii, 1749; **79**, 2329.

Maj. J. W. Barlow. Report, **74**, ii, 607.

Lt. T. N. Bailey. Report, **81**, 2837^g; **82**, 2833^h.

Lt. O. M. Carter. Reports, **83**, 2389ⁱ; **84**, 2383^j.

Capt. W. L. Marshall. Reports, **94**, 3451; (Maj.) **95**, 4253; **96**, 4073; **97**, 4131.

Capt. C. E. Gillette. Reports, **92**, 3457; **93**, 4401.

ASSISTANTS:

T. H. Safford. Report, **78**, 1243^k.

Lt. G. S. Anderson, 6th Cav. Report^l, **76**, iii, 739.

Lt. T. M. Woodruff, 5th Inf. Report, **77**, ii, 1409, 1467^j.

Lt. C. A. H. McCauley, 3rd Art. Report, **78**, iii, 1750^k.

Prof. A. Gray. Report, **78**, iii, 1832^e.

T. S. Brandegee, C. E. Report, **78**, iii, 1841^e.

Prof. C. T. Thomas. Report, **78**, iii, 1843^m.

Prof. H. Strecker. Report, **78**, iii, 1847ⁿ.

Asst. Surg. C. Smart, U. S. A. Report,

79, iii, 2331^o.

Capt. H. W. Lawton, 4th Cav. Report, **83**, 2391.

B21.—Missouri, Military division of the.**Engineers.****ENGINEERS IN CHARGE:**

Maj. J. W. Barlow. Report, **74**, ii, 607.

Maj. W. E. Merrill, (Bvt. Col.). Report, **68**, 1196.

Maj. G. L. Gillespie. Reports, **75**, ii, 1112; **76**, iii, 565.

Capt. G. J. Lydecker. Reports, **77**, ii, 1135; **78**, iii, 1669.

Capt. J. F. Gregory. Reports, **79**, iii, 2315; **80**, 2501; **81**, 2829; **82**, 2827; **83**, 2383.

Maj. T. H. Handbury. Reports, **84**, 2379; **87**, 3145.

Capt. W. L. Marshall. Reports, **88**, 2813; **89**, 2875; **90**, 3600; **91**, 3943.

B22.—New Mexico.**Engineers.**

CHIEF OF ENGINEERS. Reports, **79**, 189; **81**, 340.

ENGINEERS IN CHARGE:

Lt. E. H. Ruffner. Report, **79**, 2343.

Lt. C. A. Stedman, 9th Cav. Reports, **79**, 2343. Reconnoissance, Santa Fe to

Ft. Stanton, **79**, iii, 2348. North Star Road, Ft. Bayard to the canyon on the Black River, **79**, iii, 2351.

Lt. T. N. Bailey. Report, **81**, 2837; **82**, 2833ⁿ.

Second Lt. R. T. Emmet. Report, **81**, 2841.

B23.—Northern and Northwestern Lakes—Correcting and issuing charts—Surveys.

Dates and amounts of appropriations for survey of Northern and Northwestern Lakes.

Mar. 3, 1841 \$15,000
Mar. 18, 1842 20,000
Mar. 1, 1843 30,000

June 17, 1844 \$20,000
Mar. 3, 1845 20,000
Aug. 8, 1846 25,000
Aug. 12, 1848 25,000
Mar. 3, 1849 10,000
Sept. 28, 1850 25,000
Mar. 3, 1851 25,000

^a Completion of military road, Santa Fe to Taos, N. Mex.

^b Lines of communication between southern Colorado and northern New Mexico.

^c Survey of headwaters of Red River.

^d Meteorology.

^e Botany.

^f Geology.

^g District of Missouri and New Mexico.

^h Difference of longitude, Denver, Colo., and Pueblo, Colo.

ⁱ Survey of wagon road, Ft. Garland, Colo., to Ft. Wingate, N. Mex.

^j Insects.

^k San Juan reconnoissance.

^l Entomology.

^m Orthoptera.

ⁿ Lepidoptera.

^o Analysis of Pagosa Spring, Colo.

^p Department of Missouri and district of New Mexico.

PART B.—EXPLORATIONS, SURVEYS, AND RECONNOISSANCES—Continued.

B23.—Northern and Northwestern Lakes—Correcting and issuing charts—Surveys—Continued.

Aug. 30, 1852.....	\$25,000	Mar. 3, 1893.....	\$2,000
Mar. 3, 1853.....	50,000	Aug. 18, 1894.....	2,000
Aug. 5, 1854.....	50,000	Mar. 2, 1895.....	2,000
Mar. 3, 1855.....	50,000	June 11, 1896.....	2,000
Aug. 30, 1856.....	50,000	June 4, 1897.....	2,000
Mar. 3, 1857.....	50,000	July 1, 1898.....	3,000
June 12, 1858.....	75,000	Mar. 3, 1899.....	3,000
Mar. 3, 1859.....	75,000	June 6, 1900.....	3,000
June 21, 1860.....	75,000		
Mar. 2, 1861.....	75,000	Total.....	42,000
July 5, 1862.....	105,000		
Feb. 9, 1863.....	106,879	<i>Surveys and additions to and correcting engraved plates.</i>	
July 2, 1864.....	100,000	Mar. 2, 1889.....	\$5,000
Feb. 28, 1865.....	125,000	Aug. 30, 1890.....	10,000
June 12, 1866.....	50,000	Mar. 3, 1891.....	10,000
Mar. 2, 1867.....	77,500	Aug. 5, 1892.....	5,000
Mar. 2, 1868.....	77,500	Mar. 3, 1893.....	25,000
July 20, 1868.....	75,000	Aug. 18, 1894.....	25,000
Mar. 3, 1869.....	100,000	Mar. 2, 1895.....	25,000
July 15, 1870.....	100,000	June 11, 1896.....	25,000
Mar. 3, 1871.....	175,000	June 4, 1897.....	25,000
June 10, 1872.....	175,000	July 1, 1898.....	25,000
Mar. 3, 1873.....	175,000	Mar. 3, 1899.....	25,000
June 23, 1874.....	175,000	June 6, 1900.....	75,000
Mar. 3, 1875.....	150,000		
July 31, 1876.....	^a 84,000	Total.....	280,000
Mar. 3, 1877.....	^b 94,500		
June 20, 1878.....	^c 49,500		
Mar. 3, 1879.....	85,000		
June 16, 1880.....	40,000		
Mar. 3, 1881.....	18,000		
Aug. 7, 1882.....	12,000		

Total..... 2,939,879

Printing and issue of charts for use of navigators, and electrotyping copperplates for chart printing.

Mar. 3, 1883.....	\$3,000
July 7, 1884.....	3,000
Mar. 3, 1885.....	3,000
Aug. 4, 1886.....	2,000
Mar. 3, 1887.....	2,000
Oct. 2, 1888.....	2,000
Mar. 2, 1889.....	2,000
Aug. 30, 1890.....	2,000
Mar. 3, 1891.....	2,000
Aug. 5, 1892.....	2,000

^a Not including \$16,000 applied to survey of Mississippi River.

^b Not including \$25,000 applied to survey of Mississippi River and including \$9,500 received from sale of steamers.

^c Not including \$49,500 applied to survey of Mississippi River.

^d Measurement of Minnesota Point base.

^e Tides, Lake Michigan.

^f Irregular oscillations in surface of Lake Michigan at Milwaukee.

^g Adjustment of a triangulation where angles, not directions, are the data, and where there is a single measured base.

^h Adjustment by least squares of triangles connecting Manistee Point and Keweenaw base in Lake Superior.

ⁱ Note on the probable error of latitude determinations with zenith telescope.

^j Remeasurement of Keweenaw base.

^k History of surveys.

^l Notes of European surveys.

^m Standards of length.

ⁿ Variation of length of zinc bar.

Engineers.

CHIEF OF ENGINEERS. Reports, **66**, ii, 20; **67**, 52; **68**, 74; **69**, 65; **70**, 85; **71**, 101; **72**, 99; **73**, 110; **74**, 120; **76**, 126; **76**, 116; **77**, 125; **78**, 139; **79**, 184; **80**, 244; **81**, 336; **82**, 325; **83**, 340; **84**, 345; **85**, 375; **86**, 371; **89**, 384; **90**, 350; **91**, 445; **92**, 419; **93**, 481; **94**, 437; **95**, 492; **96**, 439, 440, 441; **97**, 544; **98**, 547; **99**, 547, 633, 637; **1900**, 711.

ENGINEERS IN CHARGE:

Maj. W. F. Reynolds. Reports, **66**, ii, 43; (Lt. Col.) **67**, 553; **68**, 925; **69**, 549; **70**, 535.

Maj. C. B. Comstock. Reports, **70**, 614; **71**, 982, 991^d; **72**, 1031, 1035^c, 1040^f, 1042^g; **73**, 1169, 1175^h, 1178ⁱ; **74**, ii, 402, 444^j; **75**, ii, 852, 857^k; **76**, iii, 3, 126^l; **77**, 1105, 1110^m, 1128^j; **79**, iii, 1891; **80**, 2365; **81**, 2781, 2789ⁿ; (Lt. Col.) **82**, 2785.

PART B.—EXPLORATIONS, SURVEYS, AND RECONNOISSANCES—Continued.**B23.—Northern and Northwestern Lakes—Correcting and issuing charts—Surveys—Continued.**

- Capt. H. M. Adams. Reports, 77, 1109; 78, iii, 1355.
 Col. O. M. Poe. Reports, 91, 3927; 92, 3407; 93, 4343; 94, 3315; 95, 4159.
 Lt. Col. G. J. Lydecker. Reports, 96, 4017, 4062^a; 97, 4069; 98, 3745; 99, 3851; 1900, 5317.
ASSISTANTS:
 O. B. Wheeler. Reports^b, 66, ii, 56; 70, 552; 76, iii, 112.
 J. M. Bigelow. Report^c, 66, ii, 62.
 D. F. Henry. Report^d, 67, 582.
 O. N. Chaffee. Report, 66, ii, 218^e.
 Lt. J. F. Gregory. Report, 67, 573^f.
 Capt. F. U. Farquhar. Reports, 68, 937^g.
 I. A. Lapham. Report, 68, 993^h.
 Capt. J. A. Smith. Reports, 70, 549; 71, 994ⁱ.
 Lt. E. H. Ruffner. Report, 70, 550^j; 593; (Maj.) 93, 4364^k.
 E. S. Wheeler. Reports^l.
 Lt. A. N. Lee. Reports^m, 71, 995; 72, 1094; (Capt.) 73, 1184.
 Lt. J. H. Weeden, jr. Reports, 71, 996; 72, 1093.
 Lt. C. F. Powell. Reportsⁿ, 71, 998; (1st Lt.), 73, 1188; 74, ii, 421; 76, iii, 110.
 H. Custer. Reports, 71, 998; 73, 1185; 74, ii, 414.
 Lt. E. Maguire. Reports, 71, 1019^o; 74, ii, 420.
 S. I. Smith. Report, 71, 1020^p.
 J. E. Hilyard. Report, 72, 1046^q.
 Rear-Admiral B. F. Sands, U. S. Naval Observatory. Report, 72, 1052^r.
 Lt. W. R. Livermore. Report, 72, 1080.
 G. Y. Wisner. Reports, 72, 1097^s; 73, 1181; 74, ii, 407^t; 75, ii, 860; 76, iii, 113; 77, ii, 1201; 78, iii, 1395; 79, iii, 1930.
 A. R. Flint. Reports, 72, 1099^u; 73, 1190; 74, ii, 410; 75, ii, 863; 76, iii, 114; 77, ii, 1202; 78, iii, 1407; 79, iii, 1940; 80, 2409.
 G. A. Marr. Reports, 72, 1101; 73, 1182; 74, ii, 408; 75, ii, 862; 76, iii, 115; 77, ii, 1205.
 L. Foote. Report, 72, 1104.
 A. C. Lamson. Reports, 72, 1106; 73, 1190; 74, ii, 417; 76, iii, 119; 77, ii, 1200; 78, iii, 1398.
 J. R. Mayer. Reports, 72, 1106; 73, 1188; 74, ii, 418; 75, ii, 866; 76, iii, 121.
 F. M. Towar. Reports, 72, 1107; 73, 1191; 74, ii, 419; 75, ii, 867; 76, iii, 120; 77, ii, 1199; 78, iii, 1398.
 R. S. Woodward. Reports^v, 73, 1183; 74, ii, 412; 75, ii, 870; 76, iii, 116; 77, 1203; 78, iii, 139; 79, iii, 1931.
 Lt. D. W. Lockwood. Reports^w, 73, 1193; 74, ii, 413; 75, ii, 859; 76, iii, 116.
 Maj. J. M. Wilson. Report, 73, 1193^x.
 T. Russell. Reports, 74, ii, 456^y; 76, iii, 117^z; 79, iii, 1952^{aa}; 80, 4212^{ab}; 94,

^a Shoal off Port Austin light station, Saginaw Bay.

^b Meteorology, 71, 1008; 72, 1068; 73, 1197; 74, ii, 472; 76, iii, 103. Longitude and latitude, 71, 1014; 72, 1064, 1066; 74, ii, 434. Astronomy, 71, 1017. Computing, 72, 1095; 73, 1192; 76, iii, 112; 77, ii, 1204. Astronomical determination of points in the interior of Illinois and Wisconsin, 74, ii, 425. Difference of longitude between Detroit, Mich., and Ogden, Utah, 74, ii, 434. Water levels, 75, ii, 915; 76, iii, 80; 77, ii, 1198; 78, iii, 1411. Longitude of Toledo from Detroit, 82, 2790.

^c Meteorology.

^d Outflow of lakes, 70, 564. Theodolite comparison, 66, ii, 218. Meteorology, 67, 586; 68, 966; 69, 636; 70, 600. Gauging, 68, 949; 69, 562. Base-line measurements, 68, 947.

^e Theodolite comparison.

^f Astronomy.

^g Determination of the length of standard bar of the lake survey base-measuring apparatus.

^h Mean temperatures on the lakes.

ⁱ Primary triangulation of Lake Superior.

^j Niagara River.

^k Testing theodolite, 70, 553; 72, 1048. Determination of the constants of primary base apparatus, 71, 1003; 75, ii, 900. Reports, 74, ii, 410; 76, iii, 113; 77, ii, 1205. Comparison of survey yards, 74, ii, 466; 75, ii, 909. Comparison of 15-foot bar, 74, ii, 468. Measurement, Chicago base line, 78, iii, 1401; Sandusky base line, 79, iii, 1941. Levels of precision near Helena, Kans., 79, 1942. Olney base line, 80, 2408. Computing machines, 82, 2786. Lake Michigan, 92, 3420. St. Marys River survey, 96, 4022.

^l Magnetic observations, 72, 1195; 74, ii, 440.

^m Astronomy, 75, ii, 871; 78, iii, 1371. Magnetic work, 77, ii, 1181. Survey Mississippi River, 78, iii, 1385.

ⁿ Astronomy, 75, ii, 894.

^o Dredging studies.

^p Length of lake survey yards.

^q Description of instruments used in determining clock corrections.

^r Triangulation, 80, 2410.

^s Theodolite constants.

^t Astronomical work, 78, iii, 92. Water levels, 79, iii, 1962; 80, 2436; 81, 2799; 82, 2818. Instrument test, 82, 2789. Longitude, San Antonio, Tex., 82, 2812.

^u Measures, 74, ii, 469. Station twist, 75, ii, 913. Theodolite errors, 76, iii, 64; 77, 1203. Theodolite constants, 79, iii, 1945. Triangulation, 80, 2411.

^v Screw of comparator, 74, ii, 453. Telegraphic longitude, 76, iii, 12. Survey, Mississippi River, 77, ii, 1196; 79, iii, 1381; 79, iii, 1922. Survey, Lake Erie, 78, iii, 1394. Magnetic work, 79, iii, 1918. Longitude and latitude work, 80, 2382.

^w Water-level observations.

^x Tests of thermometers.

^y Thermometer comparisons.

PART B.—EXPLORATIONS, SURVEYS, AND RECONNOISSANCES—Continued

B23.—Northern and Northwestern Lakes—Correcting and issuing charts—Surveys—Continued.

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Lt. T. N. Bailey. Reports ^d, 75, ii, 859.

J. Eisenmann. Reports, 75, ii, 868; 76, iii, 123; 79, iii, 1935.

F. Terry. Reports, 75, ii, 869; 76, iii, 122; 77, ii, 1201; 78, iii, 1399.

T. W. Wright. Report, 75, ii, 870 ^c.

Capt. H. M. Adams, Reports ^f, 76, iii, 110; 77, ii, 1109.

Lt. Col. Clarke (Royal Engineers, England). Reports ^g.

Lt. P. M. Price. Reports ^h, 77, ii, 1198; 79, iii, 1929.

L. L. Wheeler. Reports ⁱ.

F. W. Lehnartz. Reports ^j.

J. H. Darling. Reports ^k, 76, iii, 118; 77, ii, 1203; 79, iii, 1938.

A. T. Morrow. Report, 76, iii, 124.

J. A. Ockerson. Report, 79, iii, 1931.

J. B. Johnson. Report ^l.

Prof. W. Foerster. Reports ^m.

Prof. H. A. Rowland and Prof. W. W. Jacques. Report ⁿ.

W. Voigt. Report ^o.

Capt. W. A. Jones. Report ^p.

Capt. W. L. Fisk. Report ^q.

Lt. C. S. Riché. Reports ^r.

A. O. Wheeler. Report ^s.

B. J. Thomas. Report ^t.

Maj. A. Stickney. Report ^u.

F. M. Barstow. Report ^v.

Capt. W. L. Marshall. Reports ^w.

Capt. D. C. Kingman. Reports ^x.

W. P. Judson. Reports ^y.

F. Morley. Reports ^z.

J. C. Quintus. Report ^{aa}.

L. M. Mann. Reports ^{ab}.

D. Molitor. Report ^{bb}.

Capt. S. S. Leach. Reports ^{cc}.

B. Rohnert. Report ^{dd}.

C. Y. Dixon. Report ^{ee}.

L. P. Morrison. Report ^{ff}.

G. E. Balch. Reports ^{gg}.

E. E. Haskell. Reports ^{hh}.

H. Von Schon. Reports ⁱⁱ.

J. Ripley. Reports ^{jj}.

F. C. Shenehon. Report ^{kk}.

L. C. Sabin. Report ^{ll}.

^a Latitude and longitude work.

^b Triangulation, Lake Superior to Mackinaw base line.

^c Astronomy, 76, iii, 56; magnetic work, 77, ii, 1187.

^d Instrument test, 62, 2789.

^e Astronomy, 75, ii, 889; 76, iii, 1358. Topography and hydrography, 76, iii, 9. Telegraphic longitude, 77, ii, 1182; 79, iii, 1895. Magnetic work, 78, iii, 1358. St. Lawrence River Shoals, 92, 3425, 3426.

^f Constants of Clarke yards, 75, ii, 904. Standard inch, 78, iii, 79.

^g Astronomy, 76, iii, 50. Telegraphic longitude, 78, iii, 1400. Longitude and latitude work, 80, 2886.

^h Leveling, 76, iii, 70; 77, ii, 1189; 79, iii, 1942; 80, 2426.

ⁱ Leveling, 76, iii, 70; 77, ii, 1189; 78, iii, 1386, 1408.

^j Remarks on flashing, 78, iii, 1396. Triangulation, Lakes Erie and Michigan, 80, 2411. Instrument tests, 62, 2789.

^k Sand wave and sediment observations, 79, iii, 1963.

^l Comparisons of steel meters, 80, 2368; 81, 2784.

^m Thermometer comparisons, 80, 2376.

ⁿ Instrument tests, 81, 2784.

^o Clock and chronometer comparisons, 81, 2792.

^p Survey of Marquette Harbor, 91, 3927.

^q Lake Erie, 92, 3415. Resurvey, St. Marys River, 93, 4348; 94, 3321; 95, 4165.

^r Waikiki Bay, 92, 3423.

^s Waverly Shoal, Lake Erie, 92, 3424.

^t St. Lawrence River shoals, 92, 3425, 3426.

^u Lake front, Chicago, 92, 3427; 93, 4372.

^v Lake Ontario, Black Creek shoal, 92, 3428; Niagara River, shoal off mouth, 93, 4379.

^w Lake Ontario, Black Creek shoal, 92, 3429; Niagara River, shoal off mouth, 93, 4379.

^x Lake Superior, 93, 4352; triangulation, in connection with survey of St. Marys River, 94, 3397.

^y Niagara River, discharge, 93, 4364.

^z Lake front, Chicago, 92, 3428; 93, 4372.

^{aa} Survey, 94, 3422.

^{bb} St. Lawrence River, 92, 3415; 94, 3428; 95, 4249; 96, 4062.

^{cc} Hydrographic ice survey, 95, 4235.

^{dd} Ice survey, St. Marys River, 95, 4240.

^{ee} Hydrographic survey, 95, 4245.

^{ff} Triangulation, 93, 4355; 94, 3404; 95, 4174. Mackinaw base line, 96, 4028.

^{gg} Triangulation and reduction of precise levels, 93, 4358, 4360; 94, 3403, 3409, 3426. St. Marys River work, 95, 4178; 96, 4023; 97, 4078, 4092; 98, 3747. Lake levels, 99, 3856; 1900, 5322.

^{hh} St. Marys River survey, 93, 4364; 94, 3419; 95, 4220; 96, 4056; 97, 4115, 4118.

ⁱⁱ St. Marys River, 95, 4228; 96, 4055.

^{jj} Niagara River, 1900, 5325.

^{kk} Gauging, 1900, 5362.

PART B.—EXPLORATIONS, SURVEYS, AND RECONNOISSANCES—Continued.**B24.—Northern and Northwestern Lakes—Annual water levels.**
(See B23.)**Engineers.**

CHIEF OF ENGINEERS. Reports, **88**, 316; **92**, 422; **93**, 486; **94**, 441; **95**, 497; **96**, 442; **97**, 547; **98**, 551; **99**, 637; **1900**, 715.

ENGINEERS IN CHARGE:

Col. O. M. Poe. Reports, **88**, 2807; **92**, 3429; **93**, 4381; **94**, 3319, 3430; **95**, 4159, 4251.

Lt. Col. G. J. Lydecker. Reports, **96**, 4067; **97**, 4127; **98**, 3779; **99**, 3851; **1900**, 5319, 5402.

Capt. D. C. Kingman. Report (Lake Ontario), **93**, 4382.

Maj. J. F. Gregory. Report (Lake Michigan), **93**, 4383; **94**, 3435.

Capt. S. S. Leach. Report (Ogdensburg), **93**, 4384.

W. T. Blunt. Report (Lake Erie), **94**, 3431.

Capt. G. A. Zinn. Reports (Lake Michigan), **96**, 4071; **97**, 4129; **98**, 3781.

Maj. W. S. Stanton. Reports (Lake Ontario), **96**, 4068; **97**, 4128; **98**, 3780.

Capt. G. D. Fitch. Report (Lake Ontario), **99**, 3869.

Lt. Col. J. A. Smith. Reports (Lake Erie), **94**, 3431; (Col.), **96**, 4068; **97**, 4128; **98**, 3780; **99**, 3861.

Capt. J. G. Warren. Report (Lake Michigan), **99**, 3860.

Maj. C. B. Sears. Reports (Lake Superior), **96**, 4070; **97**, 4129; **98**, 3781; **99**, 3860.

ASSISTANTS:

W. H. Harding. Reports.

Wm. T. Blunt. Report (Lake Michigan), **94**, 343.

Lt. C. H. McKinstry. Report (Lake Michigan), **94**, 3435.

B25.—Northern and Northwestern Lakes—Charts.**Engineers.**

CHIEF OF ENGINEERS. Reports, **66**, ii, 20; **67**, 52; **68**, 74; **69**, 65; **70**, 85; **71**, 101; **72**, 99; **73**, 110; **74**, 120; **75**, 126; **76**, 116; **77**, 125; **78**, 139; **79**, 194; **80**, 244; **81**, 336; **83**, 340; **84**, 345; **85**, 375; **86**, 371; **88**, 316; **89**, 384; **90**, 530.

ENGINEERS IN CHARGE:

Maj. W. F. Reynolds, (Bvt. Col.). Reports, **66**, ii, 49; **67**, 864; **68**, 932; **69**, 558; (Lt. Col.), **70**, 600.

Maj. C. B. Comstock, (Bvt. Brig. Gen.). Reports, **71**, 1020; **73**, 1068; **73**, 1201; **74**, ii, 476; **75**, ii, 918; **76**, iii, 125; **77**, 1195; (Lt. Col.), **79**, 1971; **80**, 2437; **81**, 2801.

Capt. H. M. Adams. Report, **78**, 1416.

Lt. Col. O. M. Poe. Reports, **83**, 2377; **84**, 2373; **85**, 2519; **87**, 3143; **88**, 2810; (Col.), **89**, 2865; **90**, 3588.

B26.—Northern and Northwestern Lakes—Gauging outlet.**Engineers.**

CHIEF OF ENGINEERS. Report, **70**, 86.

ENGINEER IN CHARGE. Maj. H. L. Ab-

bot, (Bvt. Brig. Gen.). Criticism of Assistant Engineer Henry's gauging observations, **70**, 616, 629.

B27.—One hundredth meridian.

Territory south of Central Pacific R. R., embracing parts of eastern Nevada and Arizona.

(Topographical and geographical surveys and explorations west of the one hundredth meridian.)

List of publications, **78**, iii, 1656.

Engineers.

CHIEF OF ENGINEERS. Reports, **71**, 101, 103; **73**, 113; **74**, 122; **75**, 130; **76**, 120; **77**, 120, 127; **78**, 142; **79**, 186; **80**, 245; **81**, 338; **82**, 326; **83**, 341; **84**, 346; **85**, 376.

ENGINEERS IN CHARGE:

Lt. G. M. Wheeler. Reports, **73**, 1211,

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Lt. M. M. Macomb, 4th Inf. Reports, **81**, 2805; **82**, 2821; **83**, 2379.

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Lt. R. L. Hoxie. Reports, **74**, ii, 481; **75**, ii, 957.

Lt. W. L. Marshall. Reports, **74**, ii, 483; **75**, ii, 957, ^c967; **76**, iii, 300, ^c370.

Actg. Asst. Surg. H. C. Yarrow, U. S. A. Reports, **74**, ii, ^d583; **75**, ii, 1059; **76**, iii, ^e532; **78**, iii, ^f1623, ^g1628.

Prof. E. D. Cope. Reports, **74**, ii, ^h591; **75**, ii, 921, 981, 1086.

^a Lake Michigan water level curves.

^b Plan of publication of the report.

^c Meteorology and hypsometry.

^d Natural history.

^e Ethnological research.

^f Fishes.

^g Reptiles and batrachians.

^h Geology—paleontology.

PART B.—EXPLORATIONS, SURVEYS, AND RECONNOISSANCES—Continued.

B27.—One hundredth meridian—Continued.

- Lt. P. M. Price. Report, **75**, ii, 960.
 Lt. R. Birnie, jr., 13th Inf. Reports, **75**, ii, 961, *a* 1098; **76**, iii, 350; **77**, 1282; **78**, iii, 1544; **79**, iii, 2215.
 Lt. S. E. Blunt, Ord. Corps. Report, **75**, ii, 963.
 Lt. C. W. Whipple, 3d Art. Reports, **75**, ii, 964; **76**, iii, 367.
 Dr. O. Leow. Reports, *b* **75**, ii, 1017; *b* **76**, iii, 393; *c* **75**, ii, 1049; *c* **76**, iii, 434, 422; *a* **75**, ii, 1094; *d* **76**, iii, 372, *e* 393; *f* **76**, iii, 408, *g* 434; **76**, iii, *h* 541; **76**, iii, *i* 442, *j* 548.
 Dr. J. T. Rothrock, acting assistant surgeon, U. S. A. *k* Reports, **75**, ii, 1037; *k* **76**, iii, 422.
 H. W. Henshaw. Reports, *l* **75**, ii, 1069, 1073; *l* **76**, iii, 444, *m* 525; *m* **77**, ii, 1303; *m* **77**, iii, 525; *m* **78**, iii, 1607, *n* 1609, 1623, *o* 1628; *o* **79**, iii, 2260.
 C. E. Aiken. Report, *p* **75**, ii, 1070.
 A. S. Gatchet. Reports, *q* **75**, ii, 1100; **76**, iii, 550.
 Lt. E. Bergland. Reports, **76**, iii, 329; **77**, ii, 1250; **78**, iii, 1525.
 Lt. W. L. Carpenter, 9th Inf. Reports, **76**, iii, 346; *r* **76**, iii, 521.
 Lt. C. C. Morrison, 6th Cav. Reports, **76**, iii, 356; **77**, ii, 1273; **78**, iii, 1553.
 Prof. J. Morcou. Reports, *s* **76**, iii, 378; *t* **78**, iii, 1648.
 A. R. Conkling. Reports, *u* **76**, iii, 419; *u* **77**, ii, 1285, 1295, 1298; *u* **78**, iii, 1589, 1608.
 S. H. Scudder. Report, *v* **76**, iii, 498.
 J. L. Le Conte, M. D. Report, *v* **76**, iii, 516.
 Lt. S. E. Tillman. Reports, **77**, ii, 1253; **78**, iii, 1529; **79**, iii, 2187.
 Lt. T. W. Symons. Reports, **77**, ii, 1257; **78**, iii, 1535; **79**, iii, 2192.
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 P. R. Uhler. Report, *x* **77**, ii, 1322.
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 Prof. D. S. Jordan. Report, *z* **78**, iii, 1609.
 Lt. E. Griffin. Report, **79**, iii, 2201.
 Lt. H. H. Ludlow, 3d Arty. Report, **79**, iii, 2239.
 Prof. T. H. Safford, Ph. D. Report, *z* **79**, iii, 2242.
 J. H. Clark. Report, *z* **79**, iii, 2243.
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 Prof. J. J. Stevenson. Report, *aa* **79**, iii, 2249, 2259.

B28.—Pacific, Division of the.

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Maj. R. S. Williamson (Bvt. Lt. Col.). Report, **68**, 870.

Lt. J. C. Mallery. Reports, **75**, ii, 1238; **76**, iii, 750; **77**, ii, 1441; **78**, iii, 1878.

Capt. J. H. Coster, 8th Cav. Report, **78**, iii, 1878.

Lt. C. F. Palfrey. Report, **79**, iii, 2397.

- a* Ruins.
- b* Geology and mineralogy.
- c* Agricultural researches.
- d* Meteorological conditions, Mohave Desert.
- e* Geology—mineralogy.
- f* Alkaline lakes, springs, etc.
- g* Physical and agricultural features of Mohave Desert.
- h* Ethnology.
- i* Vegetation of Mohave Desert.
- j* Effects of dry climate.
- k* Natural history and botany.
- l* Ornithology.
- m* Mammals.
- n* Fishes.

Capt. W. A. Jones. Reports, **80**, 2543; **81**, 2855; (Maj.), **82**, 2845.

Lt. J. E. Runcie, 1st Arty. Reports, **88**, 2817; **89**, 2879; **90**, 3603; **91**, 3947.

Capt. C. L. Potter (Lt. Col. U. S. Vols.). Report, *bb* **99**, 3871 (Manila).

ASSISTANTS AND OTHERS:

Lt. E. D. Thomas, 5th Cav. Reports, **76**, iii, 753; **77**, 1448.

Lt. W. G. Haan, 3d Arty. Report, **99**, 3875 (Manila).

Lt. W. P. Wooten. Report, **99**, 3876 (Manila).

Capt. F. R. Shunk. Report, **99**, 3878 (Manila).

- o* Reptiles and batrachians.
- p* Zoology.
- q* Indian languages.
- r* Insect fauna.
- s* Geology.
- t* Discoveries of California.
- u* Orthoptera.
- v* Coleoptera.
- w* Comstock Lode.
- x* Hemiptera.
- y* Survey of Great Salt Lake.
- z* Astronomy.
- aa* Geological report.
- bb* Dept. of Pacific.

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Capt. J. Biddle. Report, 1900, 5445.

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Lt. W. G. Haan, 3d Arty. Report, 99, 3875.
2d Lt. W. P. Wooten. Report, 99, 3876.
Capt. F. R. Shunk. Report, 99, 3878.

B30.—Platte, Department of the.**Engineers.**

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Lt. R. W. Petriken. Report, 68, 1197.
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Lt. D. C. Kingman. Reports, 82, 2831; 83, 2387; 84, 2381; 85, 2525.
Lt. H. M. Chittenden. Reports, 88, 2818.
Lt. F. W. Roe, 3d Inf. Report, 89, 2877.
Lt. C. A. Worden, 7th Inf. Reports, 90, 3601; 91, 3946; 92, 3459; (Capt.), 93, 4403.

B31.—Porto Rico, Engineering operations in the Department of Appropriations.

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1900, ^b500

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CHIEF OF ENGINEERS. Report, 1900, 718.
ENGINEER IN CHARGE. Capt. W. V. Judson. Report, 1900, 5449.

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B33.—Geological and geographical surveys of the War Department.**Engineers.**

CHIEF OF ENGINEERS.
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B34.—Texas, Department of.**Engineers.**

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ENGINEERS IN CHARGE:

Capt. J. F. Gregory. Reports, 77, ii, 1439; 78, iii, 1873.

Maj. W. R. Livermore. Reports, 84, 2391; 85, 2521.

B35.—Uintah Mountains, Utah.**Engineers.**

CHIEF OF ENGINEERS. Report, 72, 101.

ENGINEER IN CHARGE. Capt. W. A. Jones. Report, 72, 1108.

B36.—Yukon River, Alaska—Exploration.^d**Engineers.**

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ENGINEER IN CHARGE. Capt. C. W. Raymond, 1871.

^aCivilian assistants. 1900, 5450.

^bEquipment engr. troops. 1900, 5450.

^cInvestigation of all surveys of a scientific character under the War and Interior departments, and under the Land Office, by the National Academy of Sciences.

^dEx. Doc. 12, 42d Cong., 1st sess.

PART C.—YELLOWSTONE NATIONAL PARK, INCLUDING THE CONSTRUCTION, REPAIR, AND MAINTENANCE OF ROADS AND BRIDGES.

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	Admini- stration and protection.	Roadsand bridges.	Total.
Mar. 3, 1883...	\$16,429.97	\$23,570.08	\$40,000.00
July 7, 1884...	16,999.98	28,000.02	40,000.00
Mar. 3, 1885...	16,790.63	23,209.37	40,000.00
July 15, 1886...	984.25		984.25
Aug. 4, 1886...		20,000.00	20,000.00
Mar. 3, 1887...		20,000.00	20,000.00
Oct. 2, 1888...		25,000.00	25,000.00
Mar. 2, 1889...		50,000.00	50,000.00
Aug. 30, 1890...		75,000.00	75,000.00
Mar. 3, 1891...		75,000.00	75,000.00
Aug. 5, 1892...		45,000.00	45,000.00
Mar. 3, 1893...		30,000.00	30,000.00
Aug. 18, 1894...			30,000.00
Mar. 2, 1895...	10,565.24	89,484.76	100,000.00
June 8, 1896...			5,000.00
June 11, 1896...			35,000.00
June 4, 1897...	6,736.74	28,263.26	35,000.00
July 7, 1898...	11,356.57	28,643.43	40,000.00
Mar. 3, 1899...	5,584.64	34,465.36	40,000.00
June 6, 1900...	5,000.00	55,000.00	60,000.00
Total...	90,348.02	645,586.23	735,934.25

342; 88, 314; 89, 382; 90, 352; 91, 477; 92, 422; 93, 486; 94, 441; 99, 637; 1900, 716.

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Maj. C. J. Allen. Reports, 88, 2803; 89, 2857.

Maj. W. A. Jones. Reports, 90, 3591; 91, 3931; 92, 3433; 93, 4391; 94, 3439.

Capt. H. M. Chittenden. Reports, 99, 3863; 1900, 5403.

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Lt. W. E. Craighill. Reports, 89, 2862; 90, 3595; 91, 3939.

Lt. H. M. Chittenden. Reports, 92, 3439; 93, 4396.

A. E. Burns. Report, 1900, 5420.

C. E. Sherman. Report, 1900, 5417.

C. A. Hunt. Report (Bridges), 94, 3447.

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NOTE.—The following subjects are contained in this part:

1. Bishop's canal lock, examination.
2. California navigable waters, debris from mines injuring.
3. Honolulu Harbor, Hawaii, harbor lines (extension and modification of).
4. Joaquin, Tulare, and Sacramento Valleys, Cal. (irrigation of).
5. Laws affecting the Corps of Engineers.
6. Military Road, Fort Washakie to mouth of Buffalo Fork of Snake River, Wyo.
7. Mississippi River Commission.
8. Missouri River Commission.
9. Monument to Sergt. Charles Floyd.
10. New York, N. Y.—Harbor (supervision of).
11. River and harbor works, deterioration of, and discontinuance of appropriations for river and harbor works deemed not worthy of further improvement.
12. River and harbor works, occupation of, by private parties.
13. Stones, building (experimental tests).
14. Suro Tunnel.

D1.—Bishop's canal lock—Examination.

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(Maj. W. P. Craighill (Bvt. Lt. Col.); and Capt. W. R. King (Bvt. Maj.).

D2.—California navigable waters—Débris from mines injuring.

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Lt. Col. G. H. Mendell. Report, 82, 2543-2640.

R. A. H. Payson. Report, 82, 2584.

M. Manson. Report, 82, 2604.

A. Larson. Report, 82, 2632.

DÉBRIS COMMISSION. Reports, 94, 3169; 95, 4049, 4062; 96, 3861; 97, 3961; 98, 3549; 99, 3747; 1900, 5007.

D3.—Honolulu Harbor, Hawaii—Harbor lines (extension and modification of).

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CHIEF OF ENGINEERS. Reports, 99, 39; 1900, 40.

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Report, 99, 3772. (Maj. W. C. Langfitt, U. S. Vols.; Capt. F. J. H. Rickon,

2d U. S. Vol. Engrs., and Capt. H. A. Springett, 2d U. S. Vol. Engrs.); 1900, 5098. (Maj. Wm. Ennis, 6th Arty.; Capt. A. Slaker, 6th Arty., and 2d Lt. G. R. Hancock, 6th Arty.)

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D6.—Military Road, Fort Washakie to Mouth of Buffalo Fork of Snake River, Wyo.**Engineers.**

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Lt. A. W. Perry, 9th Cav. Report, 99, 3897.

Lt. J. A. Ryan, 9th Cav. Report, 99, 3892.

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D7.—Mississippi River Commission.

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D8.—Missouri River Commission.

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D9.—Monument to Sergt. Charles Floyd.**Engineers.**

CHIEF OF ENGINEERS. Reports, 99, 641; 1900, 722.

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D10.—New York, N. Y.—Harbor (supervision of).**Engineers.**

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Lt. Comdr. D. Delehanty. Reports, 94, 2681; 95, 3609; 96, 3395; 97, 3499.

Lt. J. F. Parker. Reports, 97, 3499; 98, 3131.

Lt. Comdrs. W. L. Field and N. J. K. Patch. Report, 98, 3131.

Lt. Comdrs. N. J. K. Patch, J. C. Fremont, and E. J. Berwind. Report, 99, 3281.

Lt. Comdr. J. C. Fremont. Report, 1900, 4513.

^a H. Ex. Doc. 290, 43d Congress, 1st sess.^b Compilation of laws for protection of navigable waters.

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D13.—Stones, building (experimental tests).

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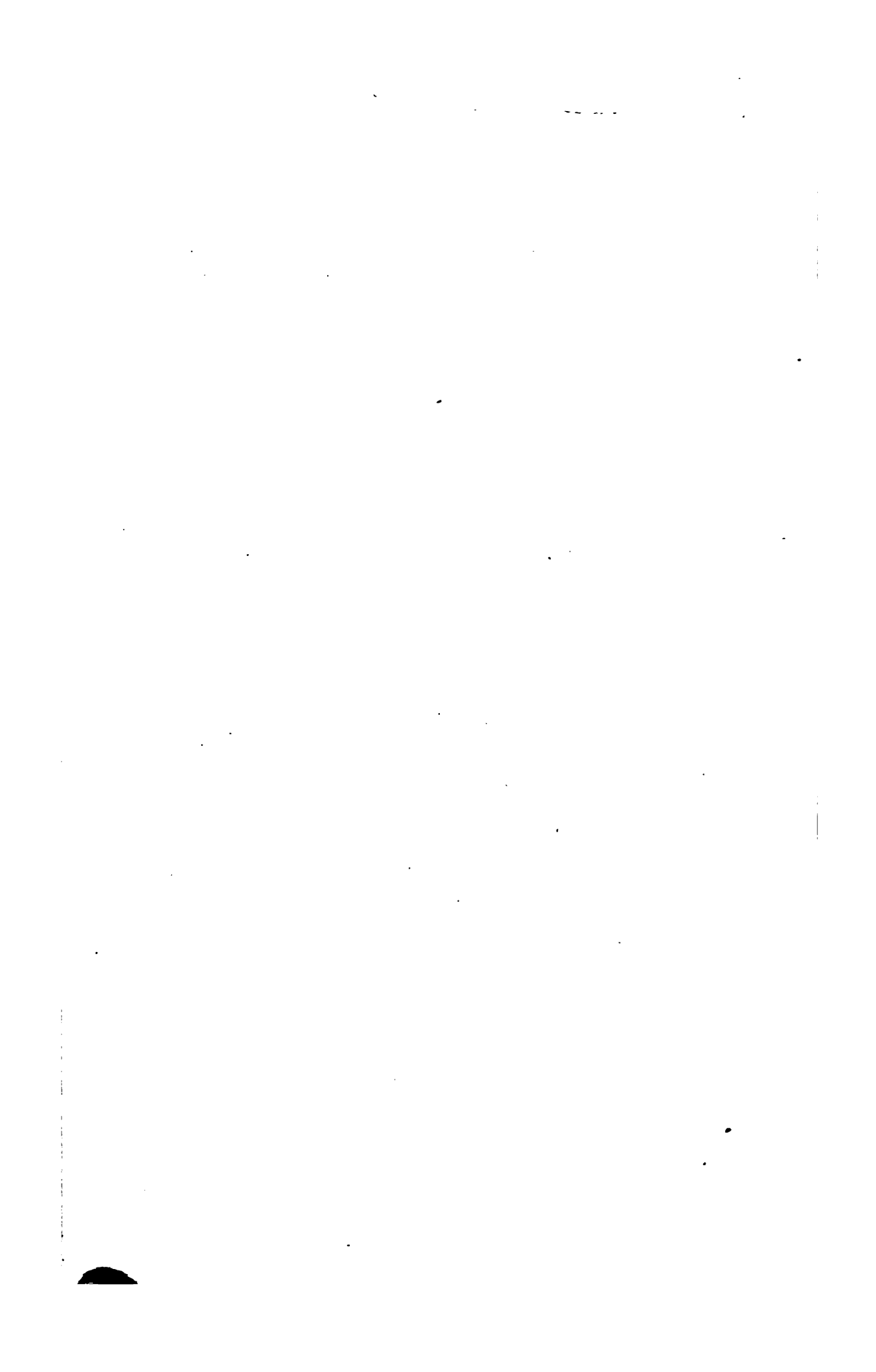
D14.—Sutro Tunnel.

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Lt. Col. J. C. Foster (Bvt. Maj. Gen.).
W. Newcomb, civil and mining engineer.



TOPICAL INDEX.

ENGINEERING, PHYSICAL, AND MISCELLANEOUS DATA, AN- NUAL REPORTS OF THE CHIEF OF ENGINEERS, U. S. ARMY, 1866-1900.

NOTE.

The more important and detailed data only have been indexed.
The nomenclature of the reports, to prevent confusion, has been adhered to generally.
The subject names are arranged in alphabetical sequence.
Cross-indexing has been freely done. Thus, the sand-tightening of piers is referred to under Piers and under Sand-tightening.
Synonymous terms refer to each other. Thus, Stone refers to Rock.
Terms not synonymous but embracing data of a more or less common nature refer to each other. Thus, Jetties refers to Dikes, Dams, and Breakwaters.
With some exceptions, all the data relating to a particular subject will be found under that subject term, or immediately following or preceding it. The exceptions are covered by cross-references. Thus, after Dams there is a cross-reference to Reservoirs for reservoir dams.
For convenience, instead of repeating a subhead common to one or more subheads following, the first subhead is printed in italics and the dashes at the beginning of the following subheads stand for the italicized words in the first subhead.

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